ELECTRICAL REVIEW

7 JANUARY 1958 PRICE 1s 6d

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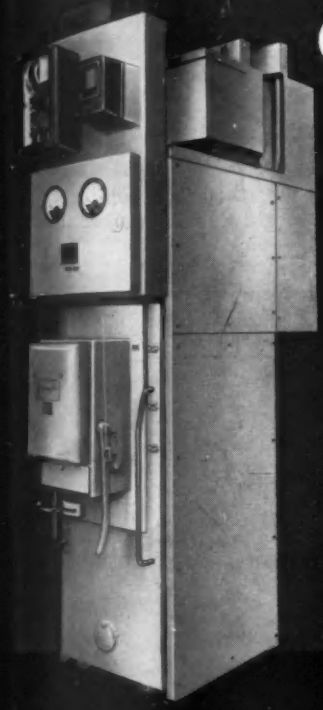

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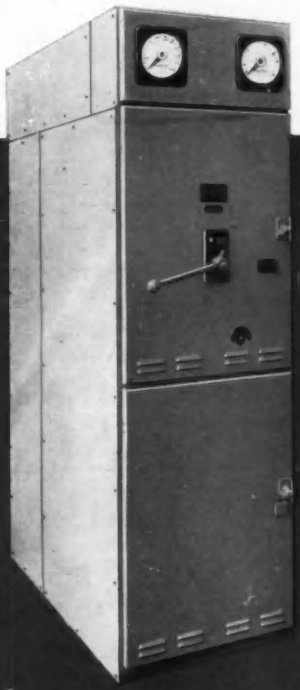

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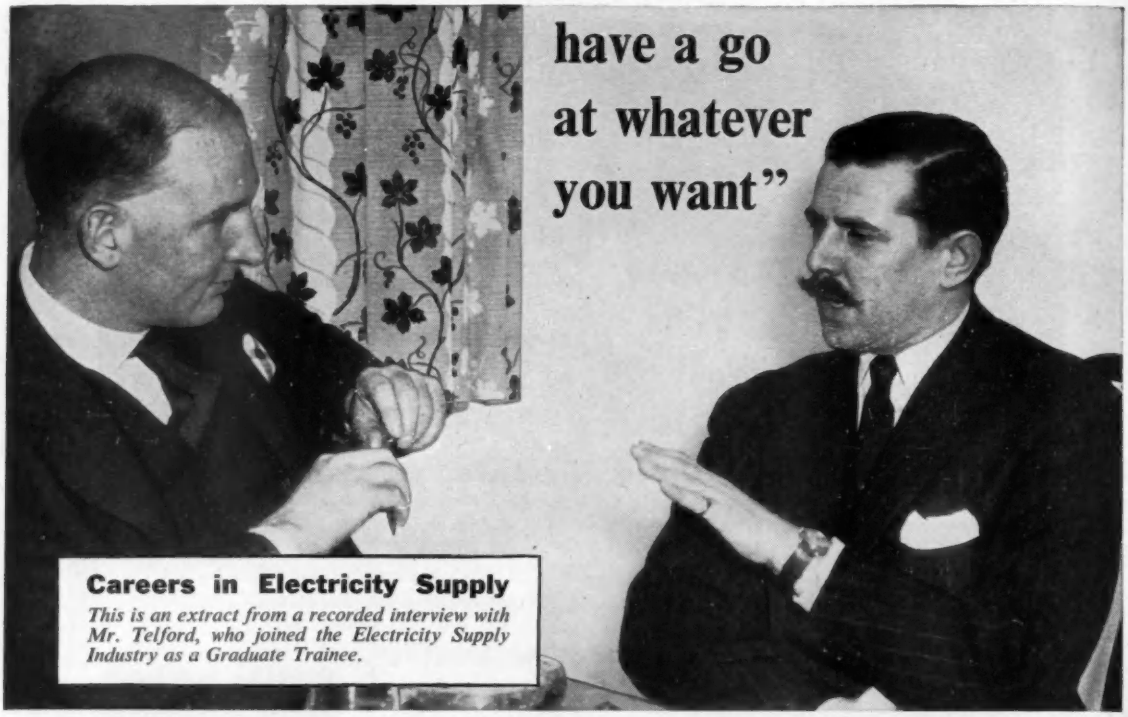

Careers in Electricity Supply

This is an extract from a recorded interview with Mr. Telford, who joined the Electricity Supply Industry as a Graduate Trainee.

E.S.I. Question Master — *Mr. Telford.*

Question Master: **I think we might begin by asking what was your first job in Electricity Supply after your training was finished?**

Mr. Telford: Well, my training was interrupted by the war, and it was only in 1950 that I finished my graduate course in the industry. I was then appointed Shift Charge Engineer at Frome, Somerset—a small station but an excellent training ground. From there I went to Earley—a much bigger station of 120 megawatts—as Boiler House Shift Engineer; later I became Charge Engineer there, and for a while was Efficiency Engineer, as well.

Q.M.: **Your next step was London, wasn't it?**

Telf: Yes, I came to London as Second Assistant Engineer on the Divisional Staff, and later I was appointed Deputy Superintendent at Bankside Generating Station—the position which I hold now.

Q.M.: **Bankside is a pretty big station, and at 36 you're young, aren't you, to be a Deputy Superintendent? But what made you come to London in the first place?**

Telf: A chance came along to get some administrative experience at H.Q. level, and I thought I'd better take it.

Q.M.: **Does the Industry give many opportunities like that?**

Telf: It most certainly does. It gives you a complete opportunity to have a go at whatever you want, and what you think you're best equipped for. The man who wants to get on is helped in every possible way; I've attended several courses run by the Industry, not only on technical matters, but on subjects like personnel selection and industrial relations.

Q.M.: **You find your job gives you scope for managerial ability—dealing with people as well as machines?**

Telf: Yes, indeed. I don't think there are many better opportunities than in a power station, because you have something of everything. You have the mechanical side, the electrical side, the building side—and most of all, a number of people with varied interests and jobs.

Q.M.: **Now a word about newcomers to the industry. If you have a chap of ability who is prepared to get down to the task, what would you say his opportunities were like?**

Telf: I would say that he has really splendid opportunities. For one thing, a career in the industry is established on a very firm footing—you could do without a lot of things, but it's impossible to get on nowadays without electrical energy. Another point worth remembering is that a man coming into the industry has the choice of the entire country to work in, and there's no parochial approach.

We'd like to publish more of this interview, but there isn't space. For details of the many careers in the Electricity Supply Industry and the salaried training schemes available ask at your local Generating or Distribution Board's offices, or write direct to:

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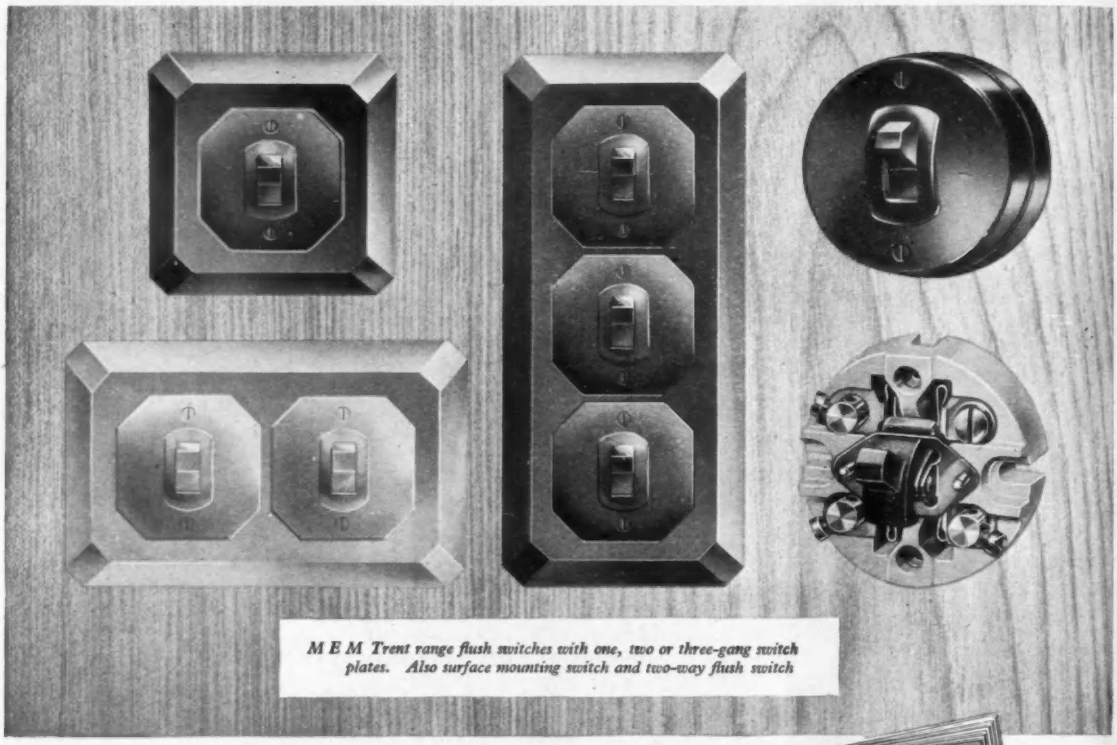

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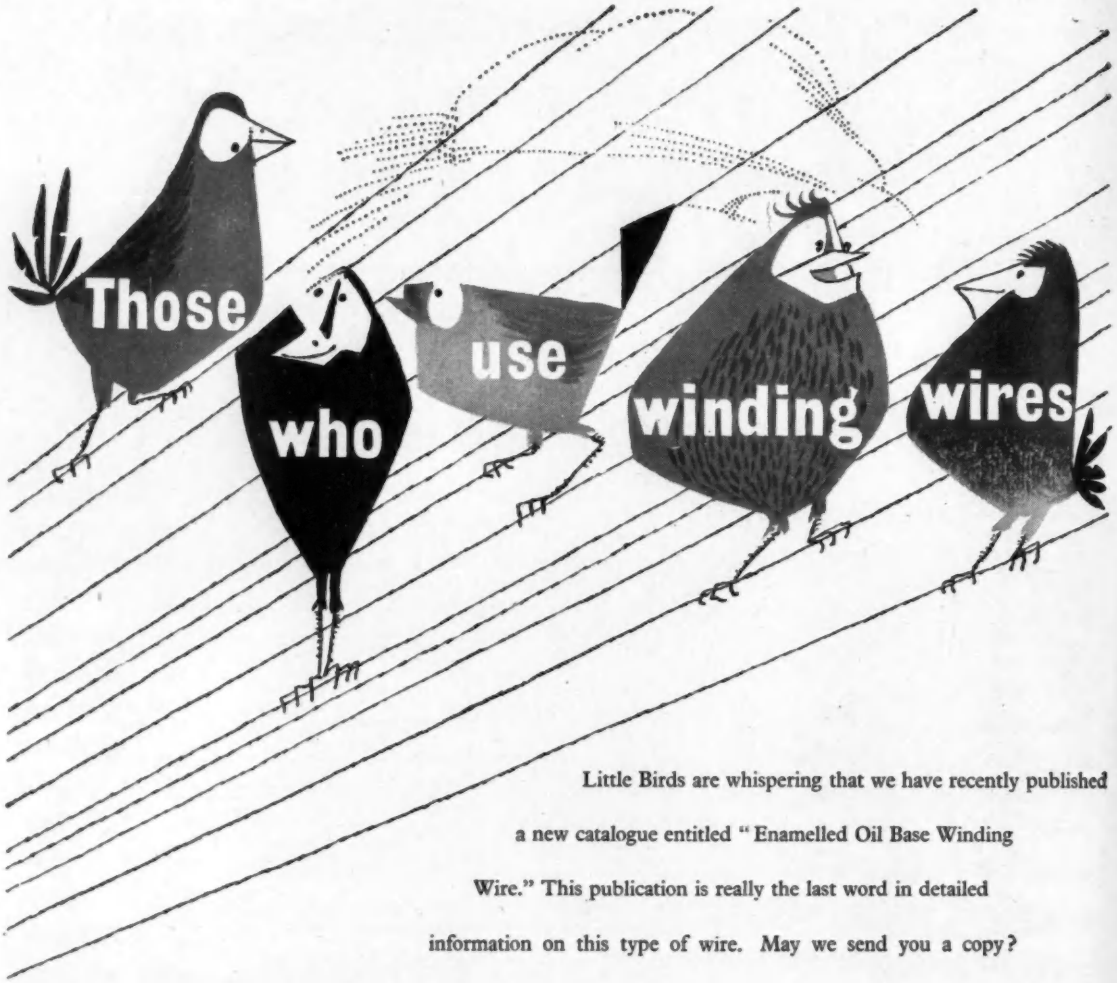

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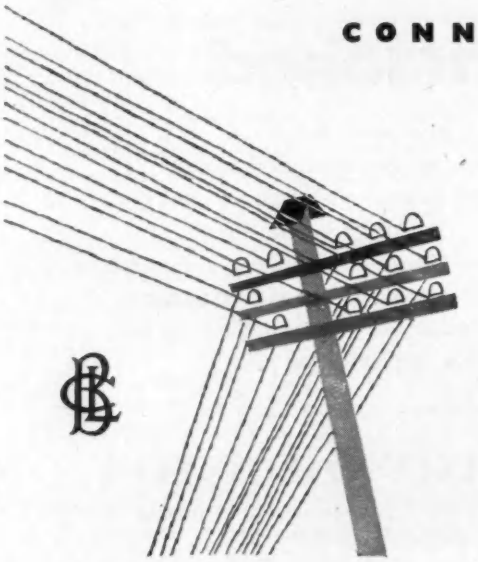

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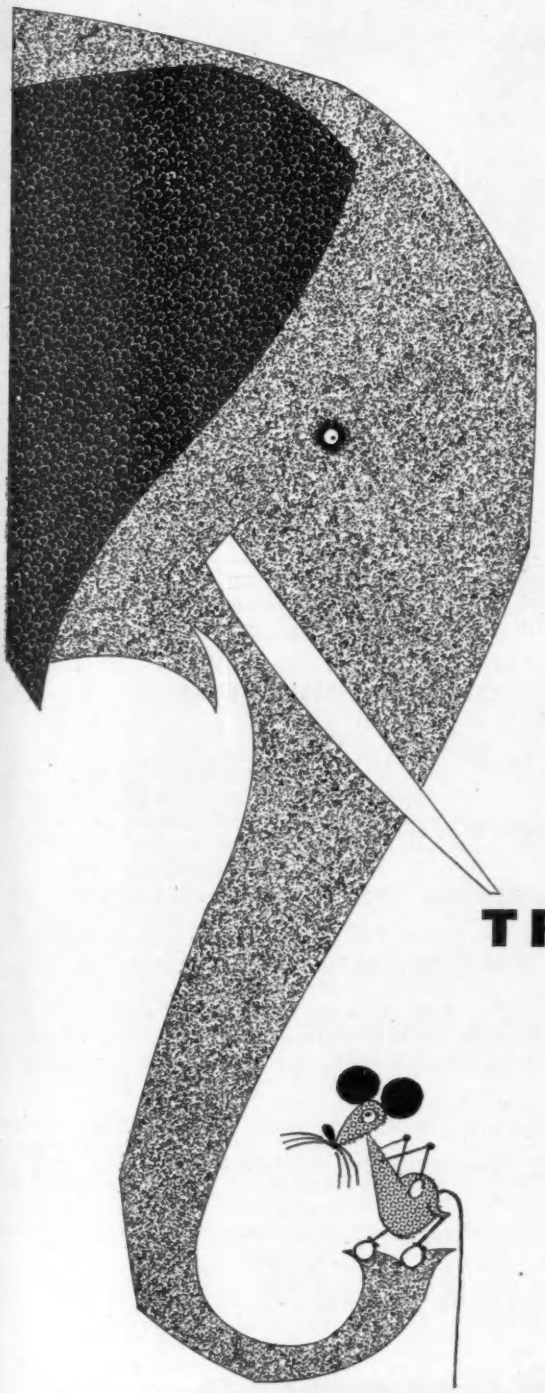

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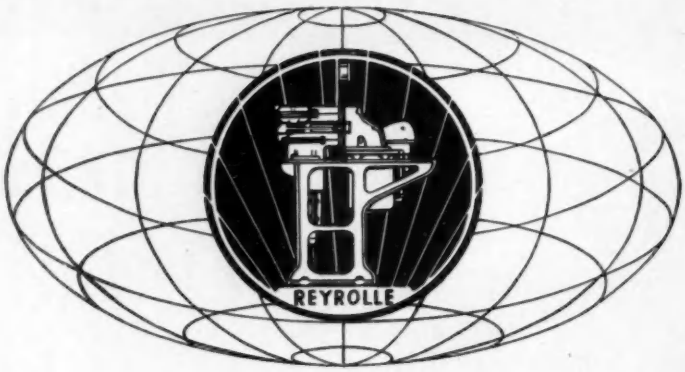

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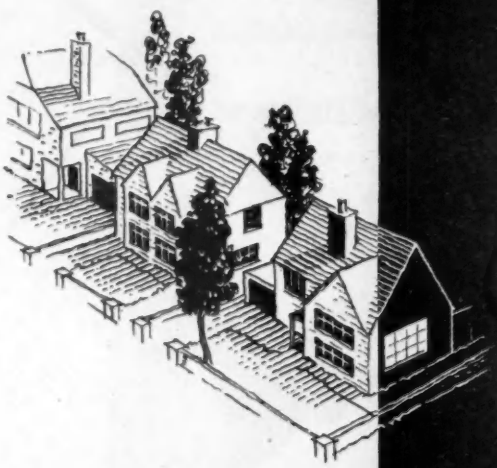

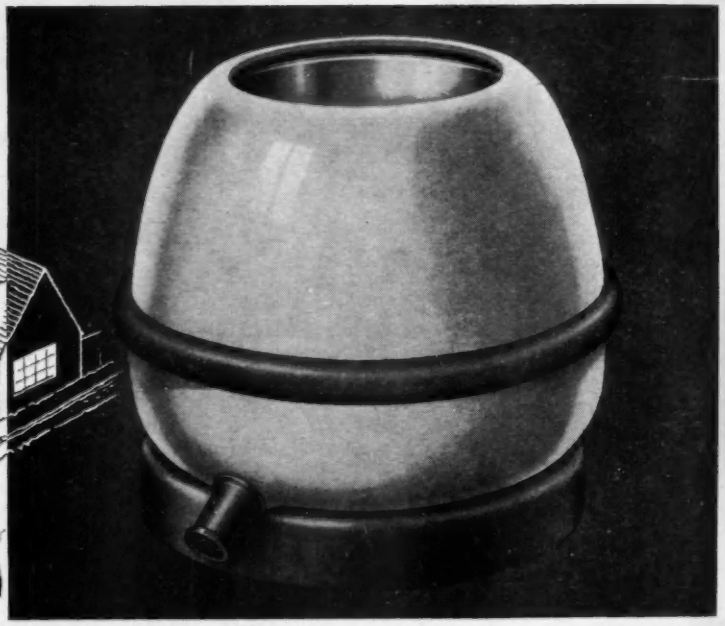

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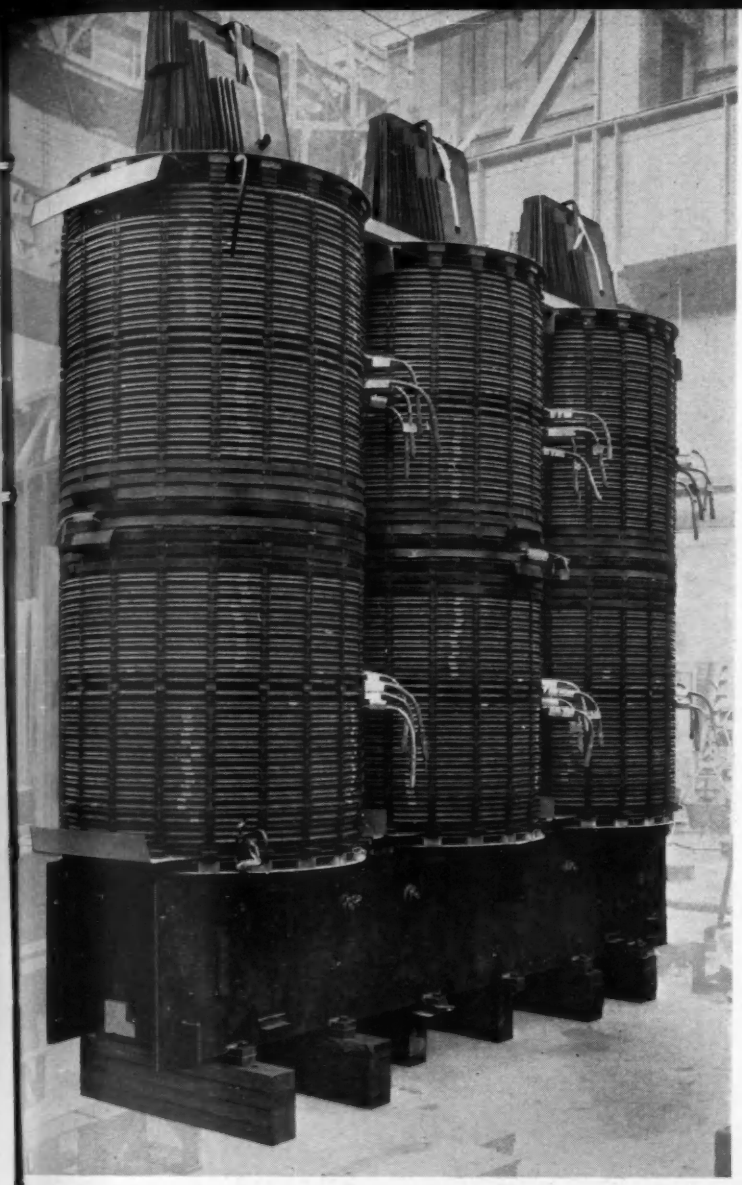

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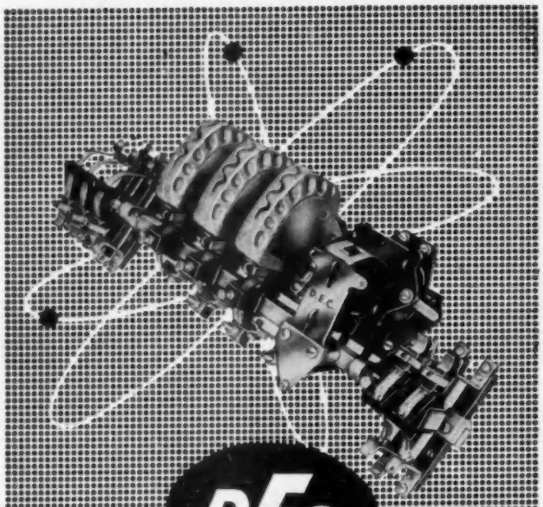

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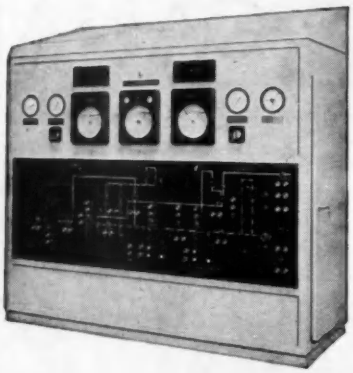

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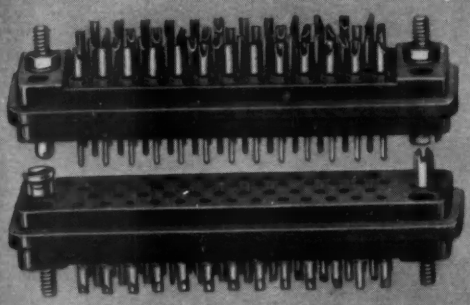

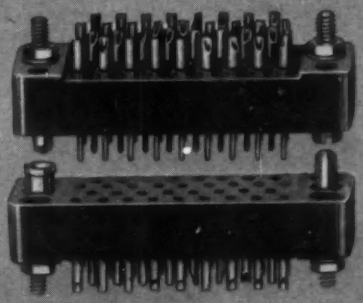

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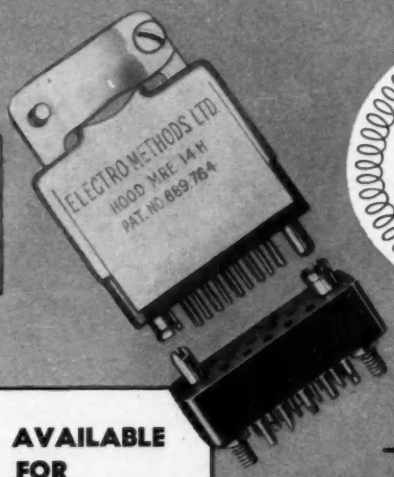

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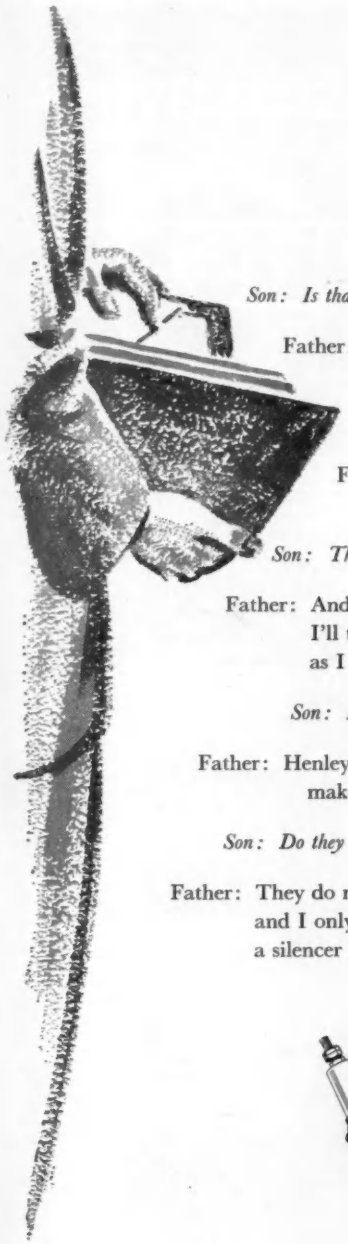

Son: Is that a Roman Candle with three tops, Daddy?

Father: No, son — it's called an indoor terminal box.

Son: What's it for, Daddy?

Father: Well, er . . . I'll tell you when you're twelve.

Son: That's what Mummy's always saying.

Father: And if you'll move over a bit, I'll telephone Henley's as I want some quickly.

Son: Henley's?

Father: Henley's are a large firm — they make these things.

Son: Do they make Roman Candles, too?

Father: They do not. They make electrical things, and I only wish their range included a silencer for small boys!

INDOOR TERMINAL BOX (Vertical Type) 11,000 V. *Send for Catalogue 32/3*

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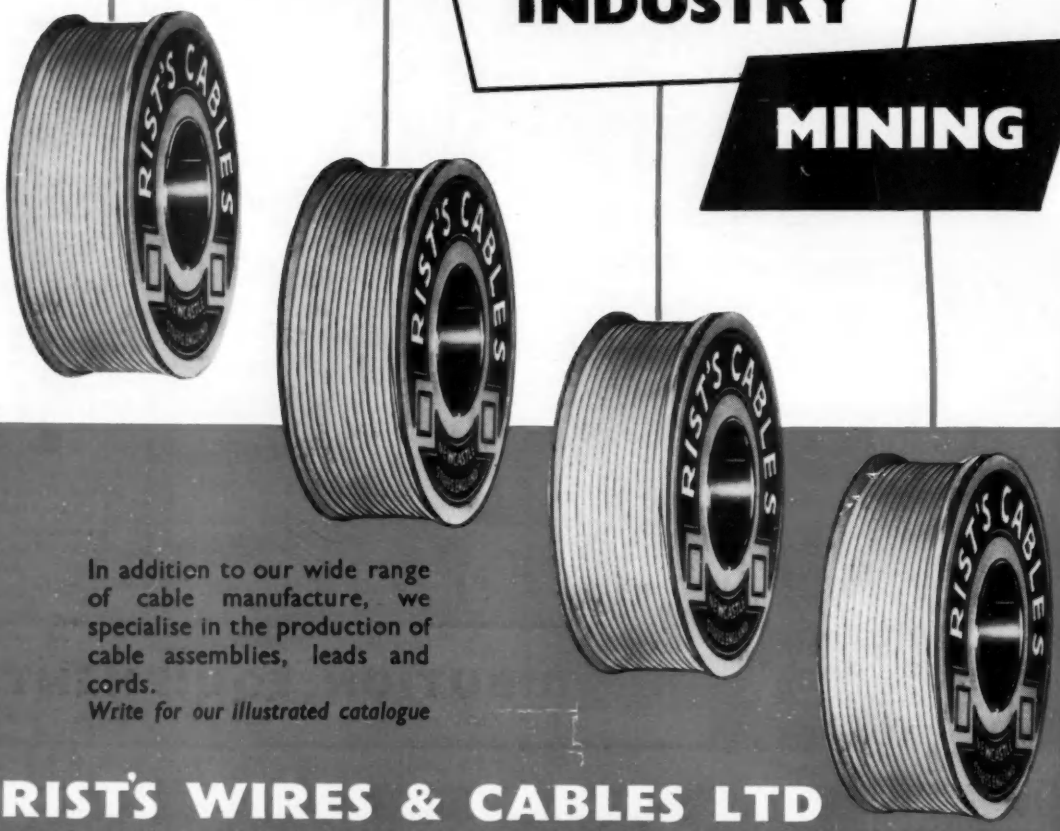

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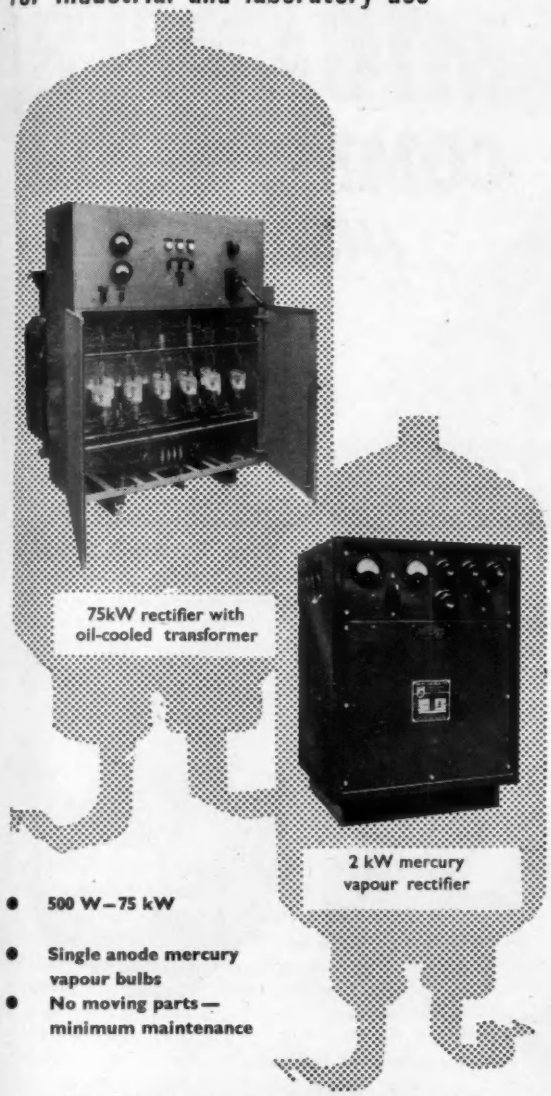

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- No moving parts—minimum maintenance

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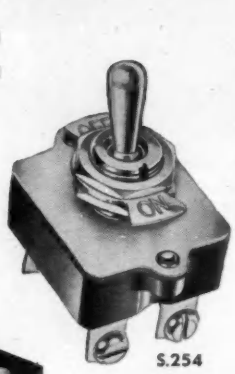
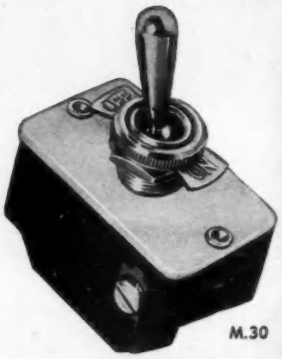
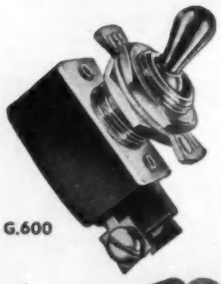


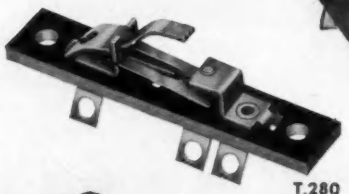
S.254



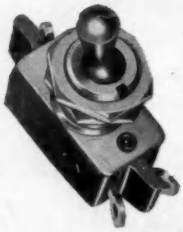
M.30



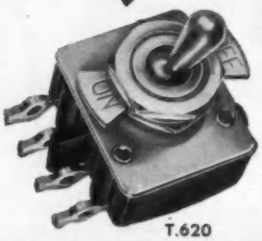
G.600



T.280



T.612



T.620

S.930

M.30	10-AMP switch for electric fires
S.254	Double pole 10-AMP switch, A.C. only
T.280	Sensitive snap action switch
G.600	3-AMP toggle switch
T.620	Double pole 3-AMP toggle switch
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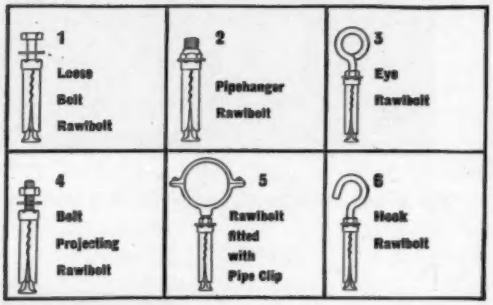

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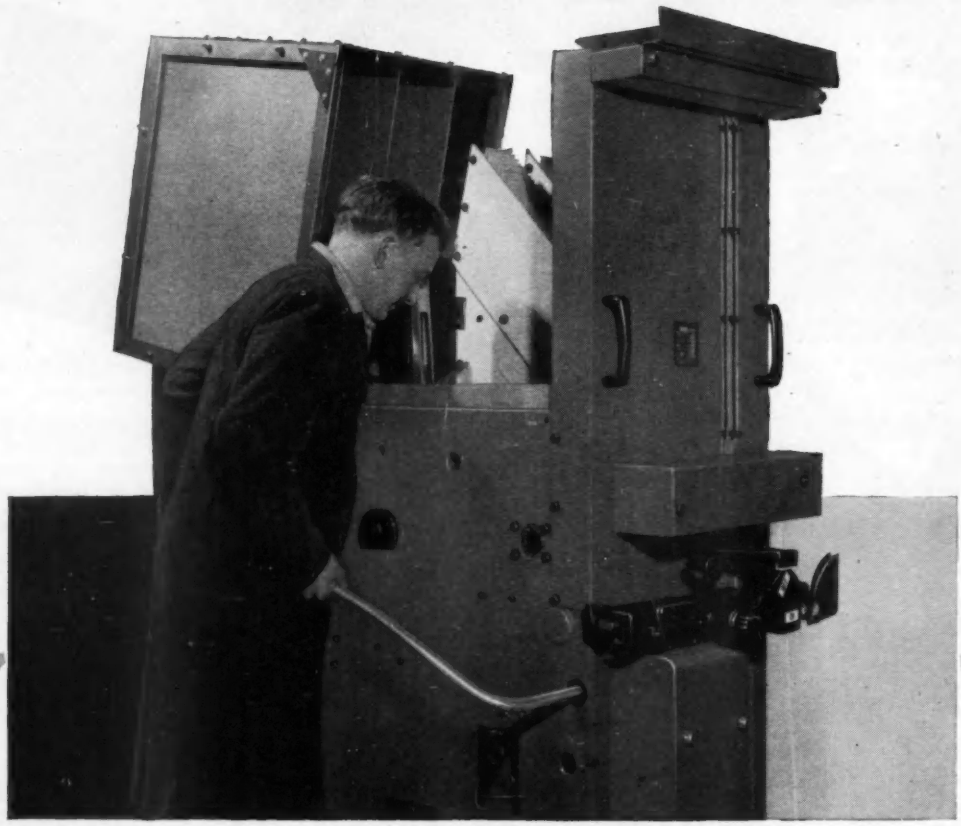
ASTA certified for 150 and 250 MVA.



This illustration shows the box barrier in the raised position, and one arc shute removed for inspection of the circuit breaker.

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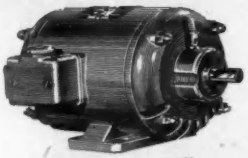

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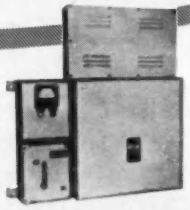

Automatic Stator Rotor Starters. Suitable for controlling slip ring motors up to 40 h.p.
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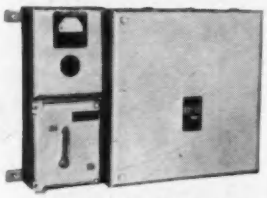

Heavy Duty Automatic Star Delta Starters. Suitable for controlling motors up to 55 h.p.
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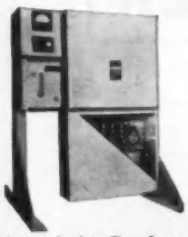

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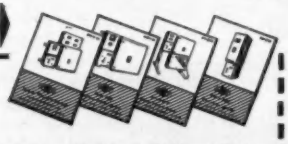

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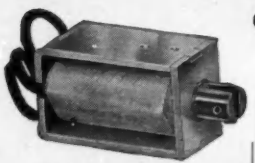

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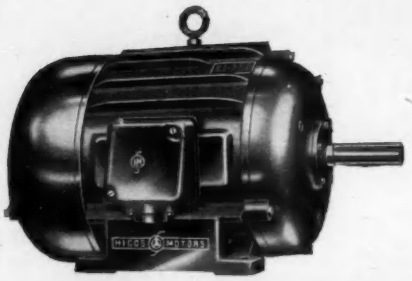

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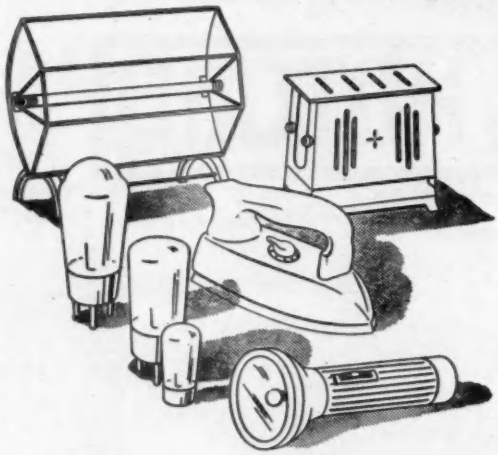

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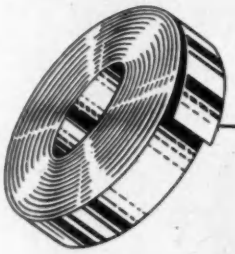

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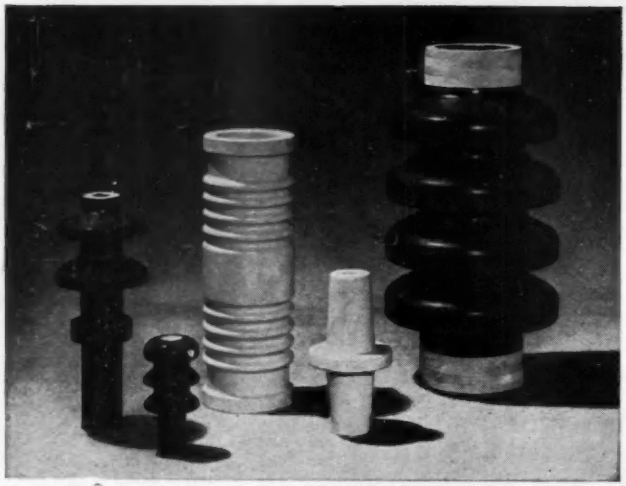

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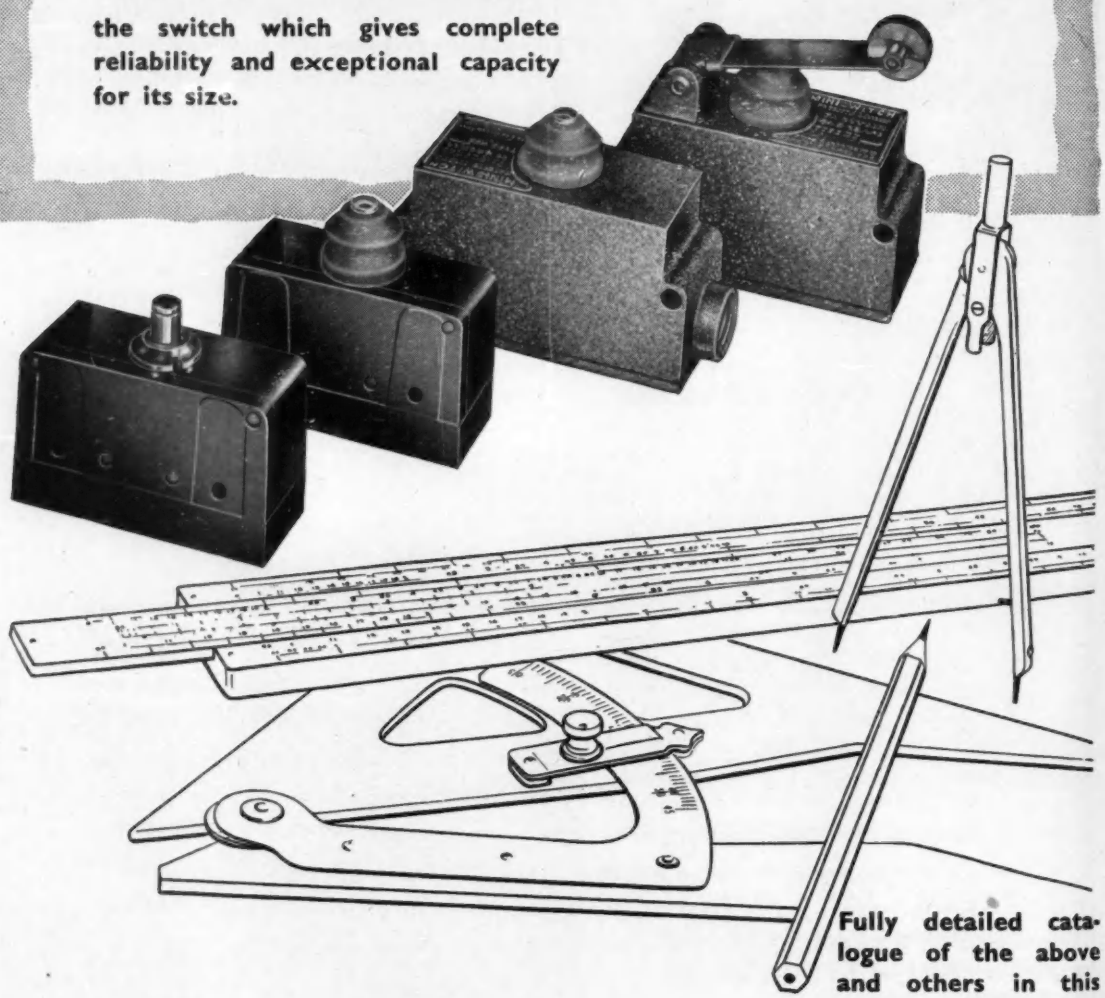

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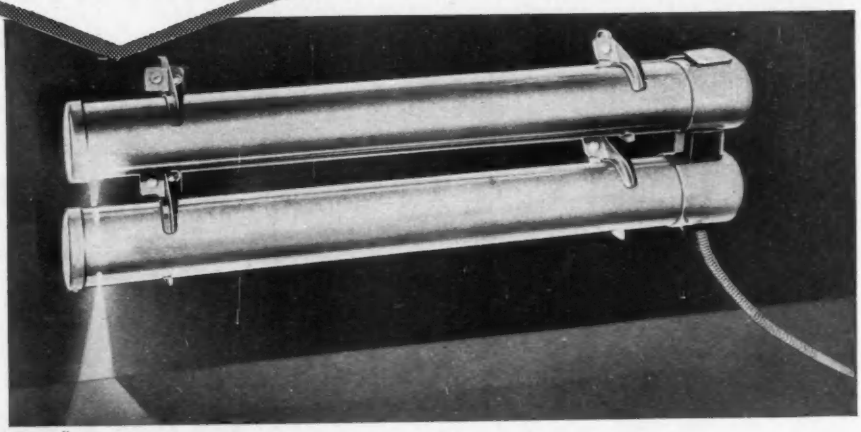

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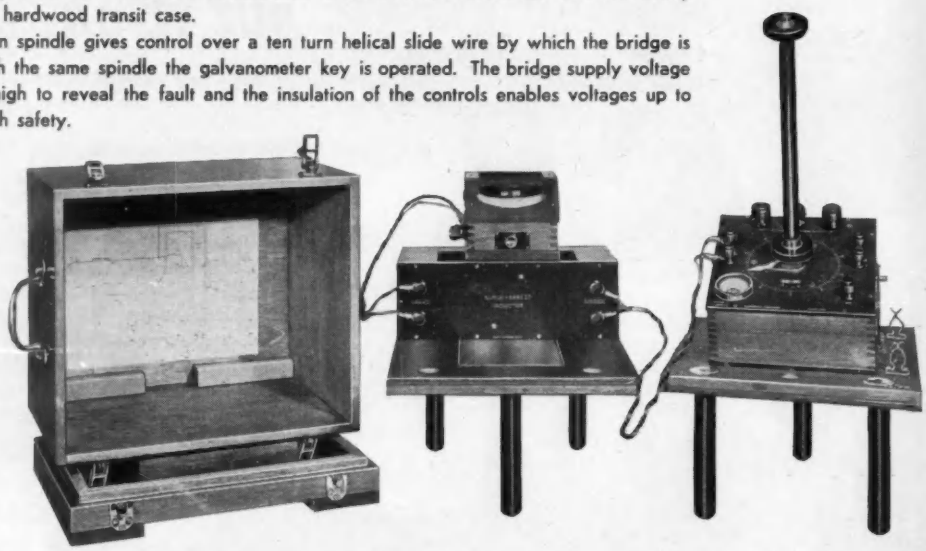

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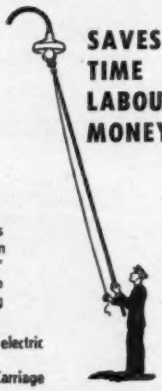

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We are now supplying installation materials for our well-known Low Voltage Overhead Grid System for Portable Inspection Lamps for your own erection. If desired, we are still glad to sub-contract for Low Voltage side of installation. Send for descriptive Brochure and price-list of our Rod Lamp Assemblies, Inspection Lamps only and **special Rough Service Low Voltage Bulbs,** whether for Overhead Grid system or for use with wall plugs—Quotations for Grid materials and Transformers to requirements.

Avoid trouble by refusing inferior copies of our Lamps or System.

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The Weir Earth Leakage Ammeter indicates earth leakage current on a three phase system with earthed neutral, making it possible to observe and correct a partial fault before it leads to a shut-down.
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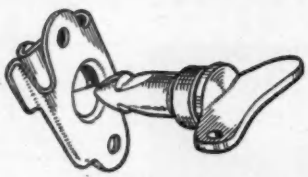
FASTENERS



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SOCKETS, PLUGS, SWITCH SOCKETS etc.
for all electrical purposes

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5-300 amp. 250-500 Volt

Diagram for Temporary Lighting with fittings connecting to 6-way Tee
Push-on Plug
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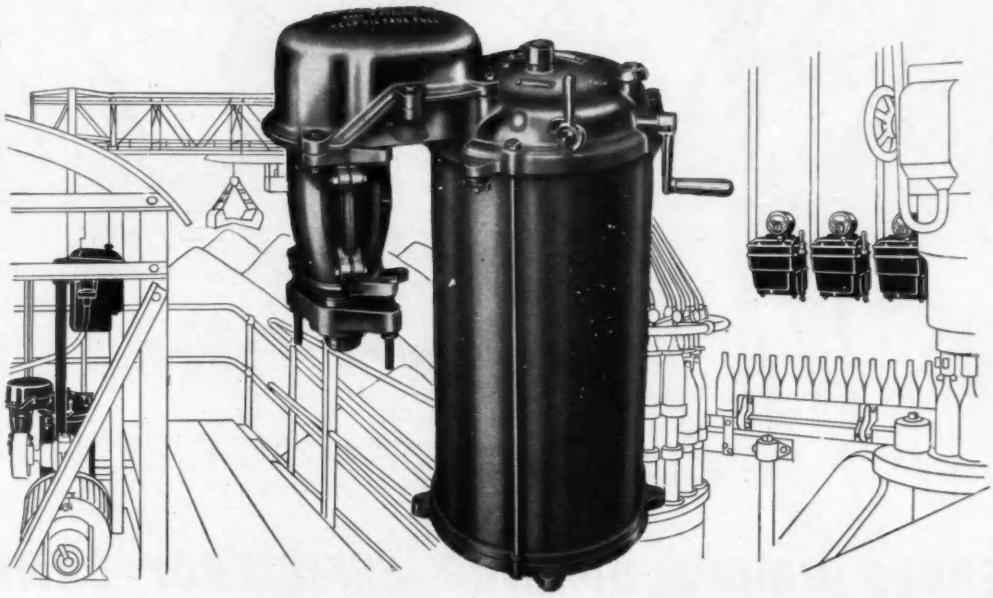
TOTALLY ENCLOSED – **Ellison Rotor Starter**

For slip-ring induction motors

for service in extreme conditions



Here's a Rotor Starter that gives long, trouble-free service in almost any working conditions. You can install it in a coal handling plant — and it won't be affected by dust or grit. Or in a dairy or food factory, and little effort is required to keep it spotlessly clean. Why? Because Ellison Rotor Starters are *totally enclosed* — so no dirt, dust or fluff can affect their working parts. More, their smooth lines make cleaning down easy.

- **Simple to install; easy to maintain**
- **Oil-cooled; contact dial in coolest place at bottom of tank**
- **Self-aligning and self-seating contacts**
- **Available with separate automatic circuit breakers — mechanically or electrically interlocked — for stator control**
- **Special packing available when hosing down is necessary**

You can rely on an ELLISON ***product***

GEORGE ELLISON
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BIRMINGHAM ENGLAND

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REDUCE PRICES OF HIGH EFFICIENCY LAMPS

Stella coiled-coil lamps give up to 20% more light than the ordinary single-coil type. They maintain that extra light for the whole of their life. They last every bit as long, stand up to vibration every bit as well. *And now they're reduced in price!* Yes, from January 15th Stella high efficiency coiled-coil lamps will cost only a fraction more than single-coil. (Full details of the price reductions below.)

40W, 60W 2/1½d reduced to 1/9d *(including P. Tax)*

75W, 100W 2/7d reduced to 2/4d *(including P. Tax)*

STELLA LAMP COMPANY LIMITED, 158/160, SHAFTESBURY AVENUE, LONDON, W.C.2

"Look how simple Tee Connections can be!"

For quick, easy, non-tensioned Tee or Service connections, BICC Overhead Line Taps are made from the minimum of components. Conductors are held parallel in a slot and locked by a clamped nut and pad—an efficient contact *which cannot be shaken loose by vibration*. The line conductor is not cut and connection can be made wherever convenient.

There are alternative taps for different types of conductor, and also to suit corrosive conditions. A separating washer is used for bi-metallic connections and bare aluminium conductors.

For protection against corrosion . . . BICC have designed a moulded rubber compound shroud (Patent Application No. 9212/56). It is made in identical halves which simply snap together. Filled with BICC Weatherproof Plastic Compound, the shroud gives complete protection.

Publication No. 338 gives further information on BICC Overhead Line Taps. May we send you a copy?

BICC

overhead LINE TAPS

BRITISH INSULATED CALLENDER'S CABLES LIMITED
21 Bloomsbury Street, London, W.C.1

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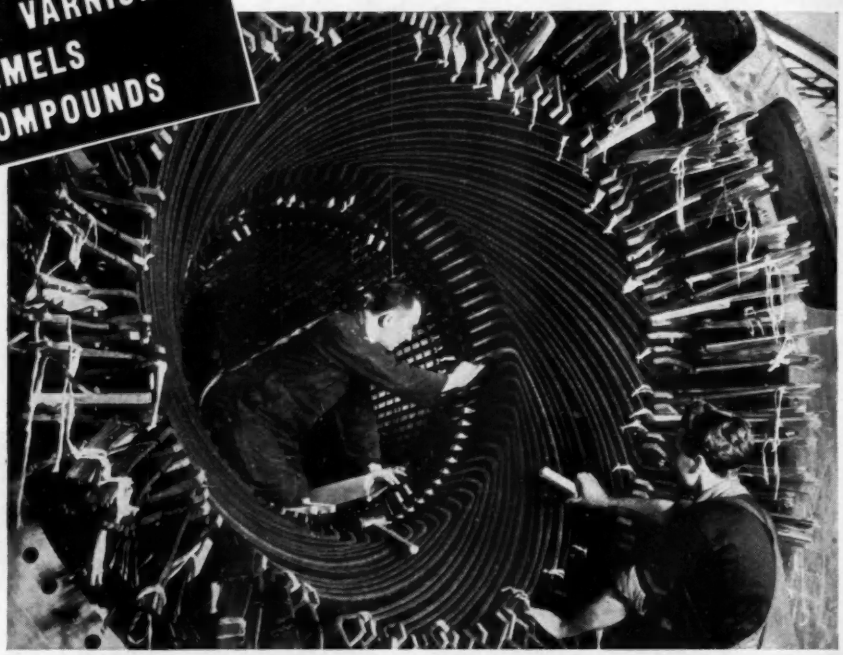
MINERVA
INSULATING VARNISHES ENAMELS AND COMPOUNDS



A Stator under construction

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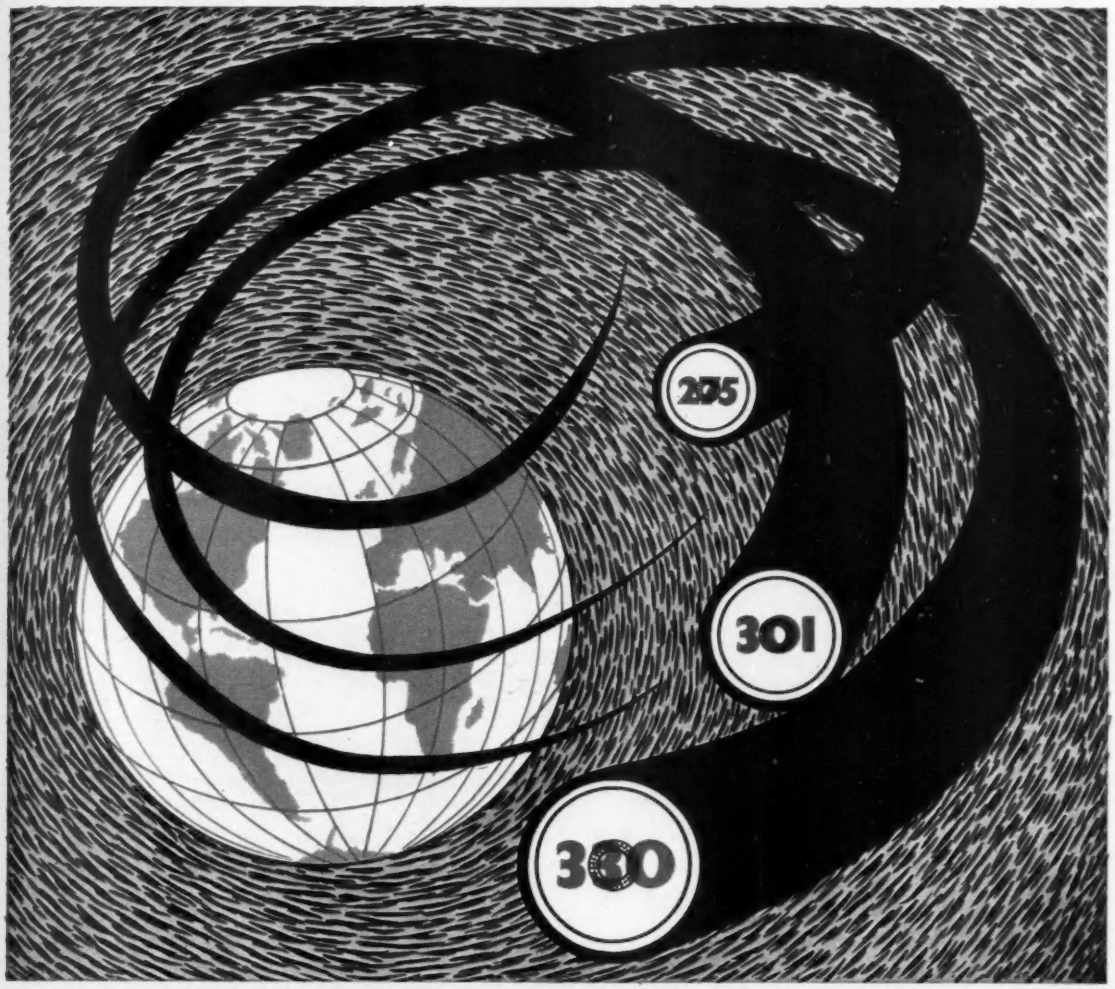


EVER INCREASING POWER DEMANDS

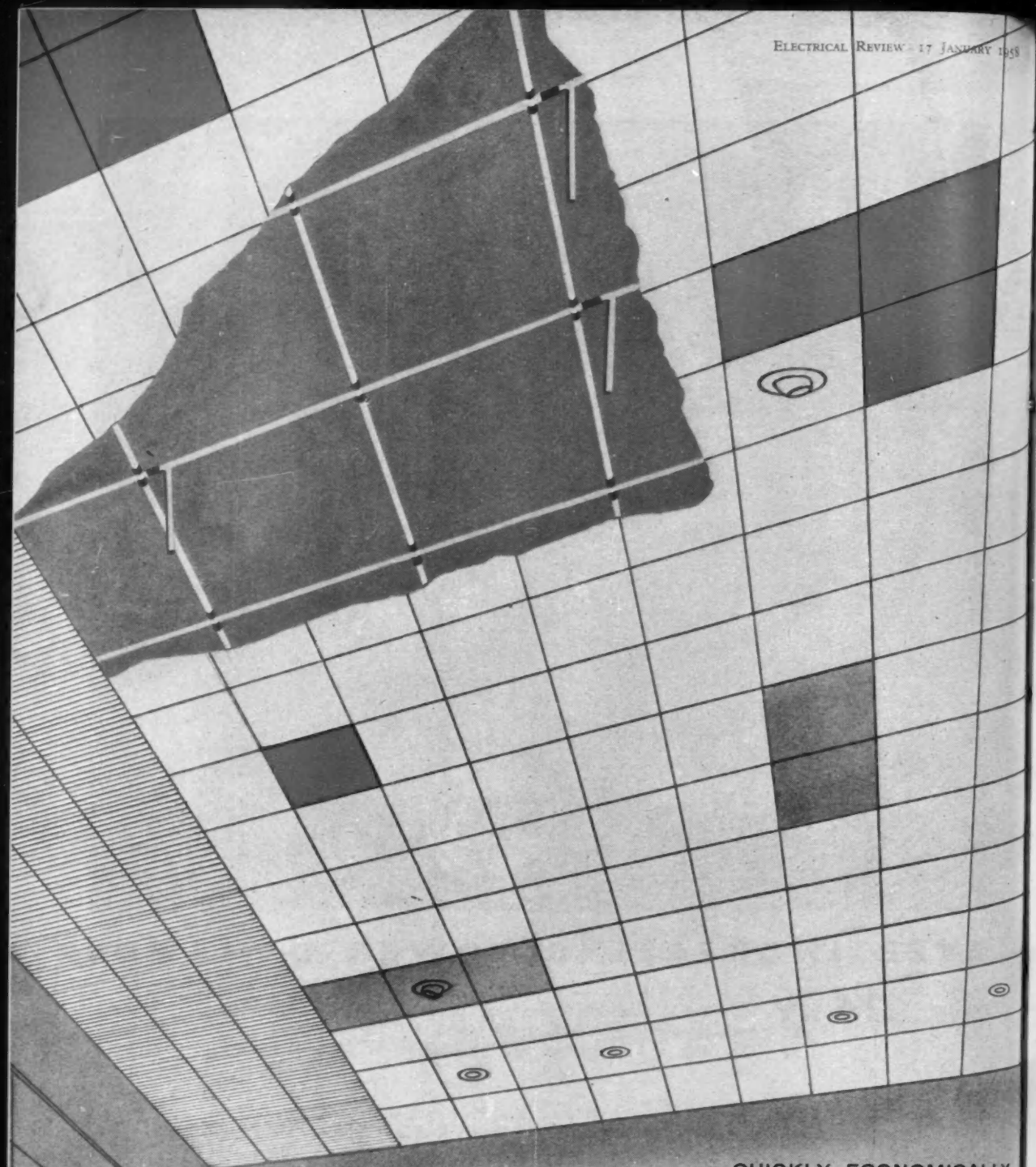
275 kV The Central Electricity Generating Board has ordered some 5,721 yards of single core 275 kV oil-filled cable.
The cable and accessories will be installed at Drakelow Power Station

301 kV Two 3-phase circuits of 3 single-core, oil-filled cables have been manufactured and installed for the Saguenay-Kitimat Company, Montreal, P.Q. for the Kemano-Kitimat project. A further repeat order for a third 3-phase circuit has been received.

330 kV An order has been received from the Snowy Mountains Hydro-Electric Authority for the manufacture and installation of two 3-phase circuits, with one spare cable, of single-core 330 kV oil-filled cables.

PIRELLI-GENERAL **OIL FILLED CABLES**

PIRELLI-GENERAL CABLE WORKS LTD., SOUTHAMPTON



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QUICKLY-ECONOMICALLY transform interiors and offer abundant scope for design.

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Details from Crompton Parkinson Limited
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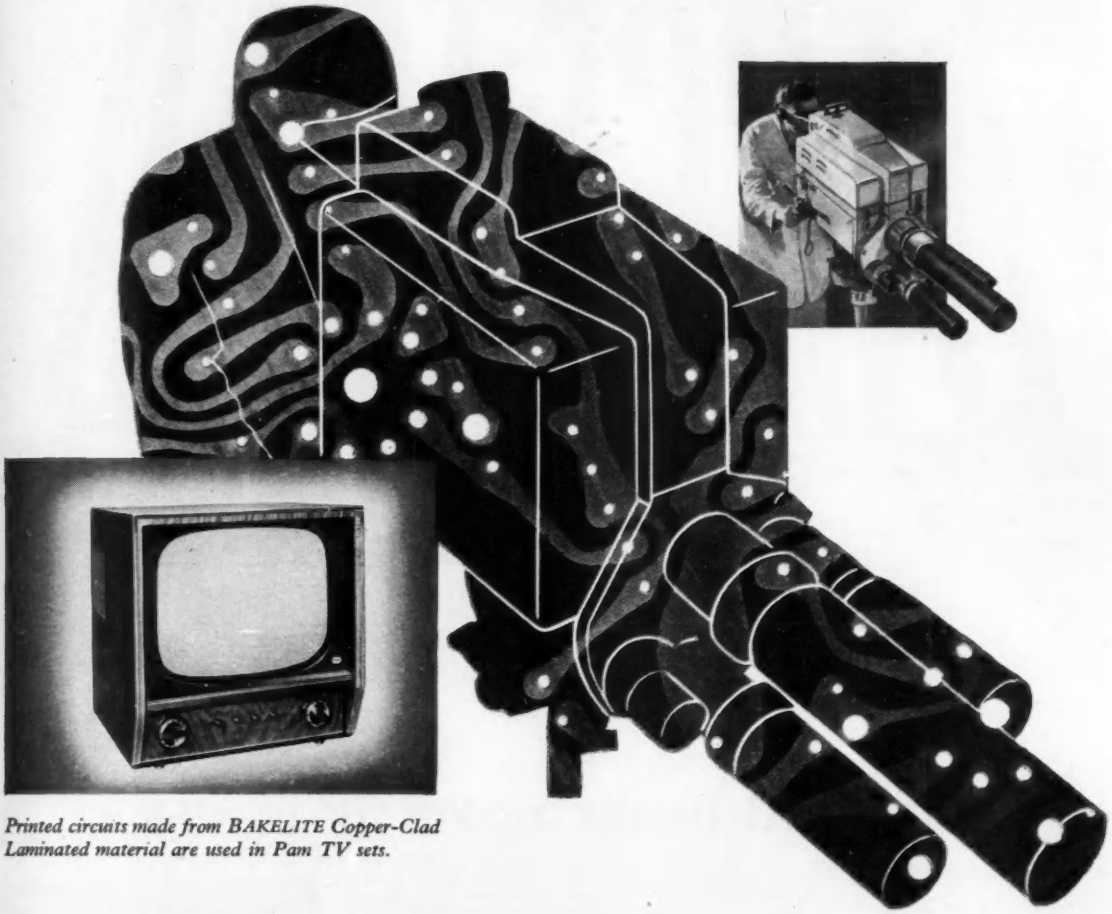

Printed circuits made from BAKELITE Copper-Clad Laminated material are used in Pam TV sets.

DRAMATIC PRODUCTION IN VIEW—
with BAKELITE Copper-Clad Laminated

TRADE MARK

Extensive use of printed circuits from BAKELITE Copper-Clad Laminated material has brought a greater efficiency into the production of television sets. The simplicity and accuracy of assembly, which are features of this technique, speed up output by as much as 300%. All soldering is done in one operation, and with less likelihood of bad connections or wrong wiring, testing is minimised and the reliability of the finished instrument considerably increased.

Today printed circuits on BAKELITE Copper-Clad Laminated Materials, either rigid or flexible, are finding new applications throughout the Radio and Electronics industries. They allow more freedom and precision to the designer, reduce production time and costs for the manufacturer, and give the customer a lighter, more compact and reliable instrument.

Write today for a copy of "Copper-Clad BAKELITE Laminated for Printed Circuits".

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TCA 1P9

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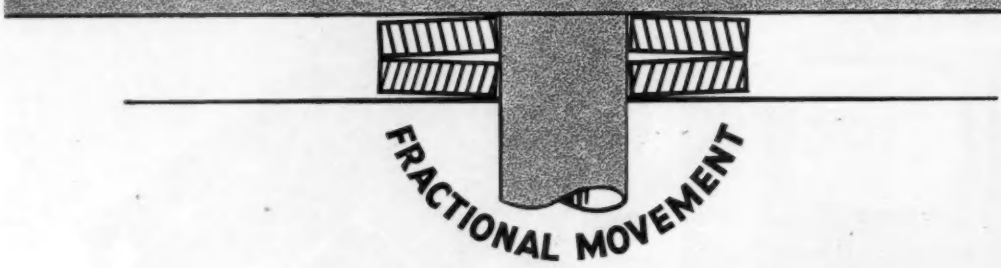
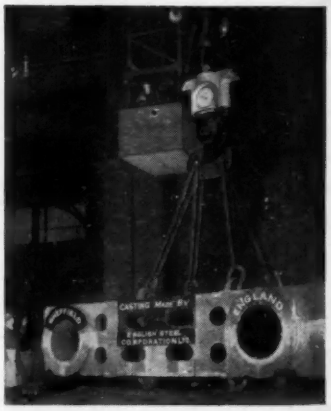


. . . and the Belleville makes it possible . . . !

The largest capacity spring balance in the world. This instrument was made to weigh giant steel castings and is graduated up to 200 tons with 1 ton sub-divisions. It is approved by the Board of Trade for "Trade" purposes, where the requirement is that the machine must be accurate to within a quarter of its smallest sub-division.
Two Belleville washers, in this instance opposed to each other, supply the spring resistant. Their total movement under full load of 200 tons is never more than $\frac{1}{16}$ of an inch.



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★ When resistance to load or thrust is beyond the capacity of helical springs,

★ When take-up of shock or sustained load must be restricted to very slight movement,

★ When many tons of dead load must be sustained plus intermittent shock or live load . .

It's time to call in* SALTER *technicians!

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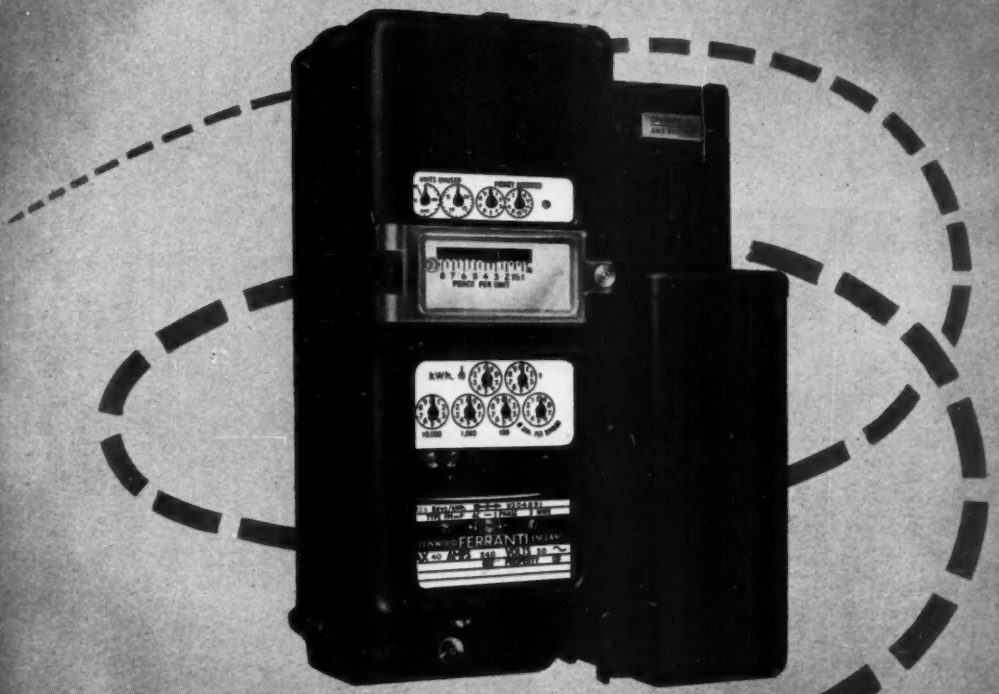

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PREPAYMENT METER

The Ferranti FMmP Prepayment Meter has a strong appeal to the Supply Engineer. The meter is built to meet modern requirements. It is robust in construction, using essential material liberally and having operating characteristics of the highest order. Ferranti also manufacture the FMmP2 meter with Fixed Charge Collector Mechanism.

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FERRANTI

FM 122/2

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'I like to deal with suppliers who treat their customers as individuals rather than order numbers. You know — the personal touch. You get it with J. & P.'

'Johnson & Phillips? They carry out some pretty big electrical projects, don't they?'

'They do. But they still manage to make every customer feel they're pleased to handle his business.'

'Shows the advantage of dealing with a medium-sized firm.'

'Yes indeed. J. & P. are just the right size for me.'

THE RIGHT-SIZED FIRM FOR YOU

J. & P. manufacture cables, transformers, switchgear, capacitors, etc., and undertake electrification schemes for many of the largest industrial concerns in this country and overseas.

They have been in the business since 1875.

But they still retain that regard for the individual customer that only the smaller firms can have.

JOHNSON & PHILLIPS

A Power in the Electrical World

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The standard of quality and performance the world over

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STOCKS of standard turned screws available for immediate use

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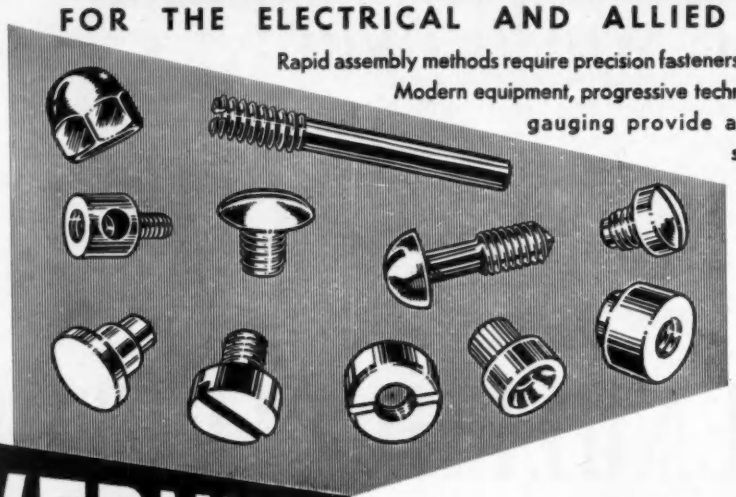

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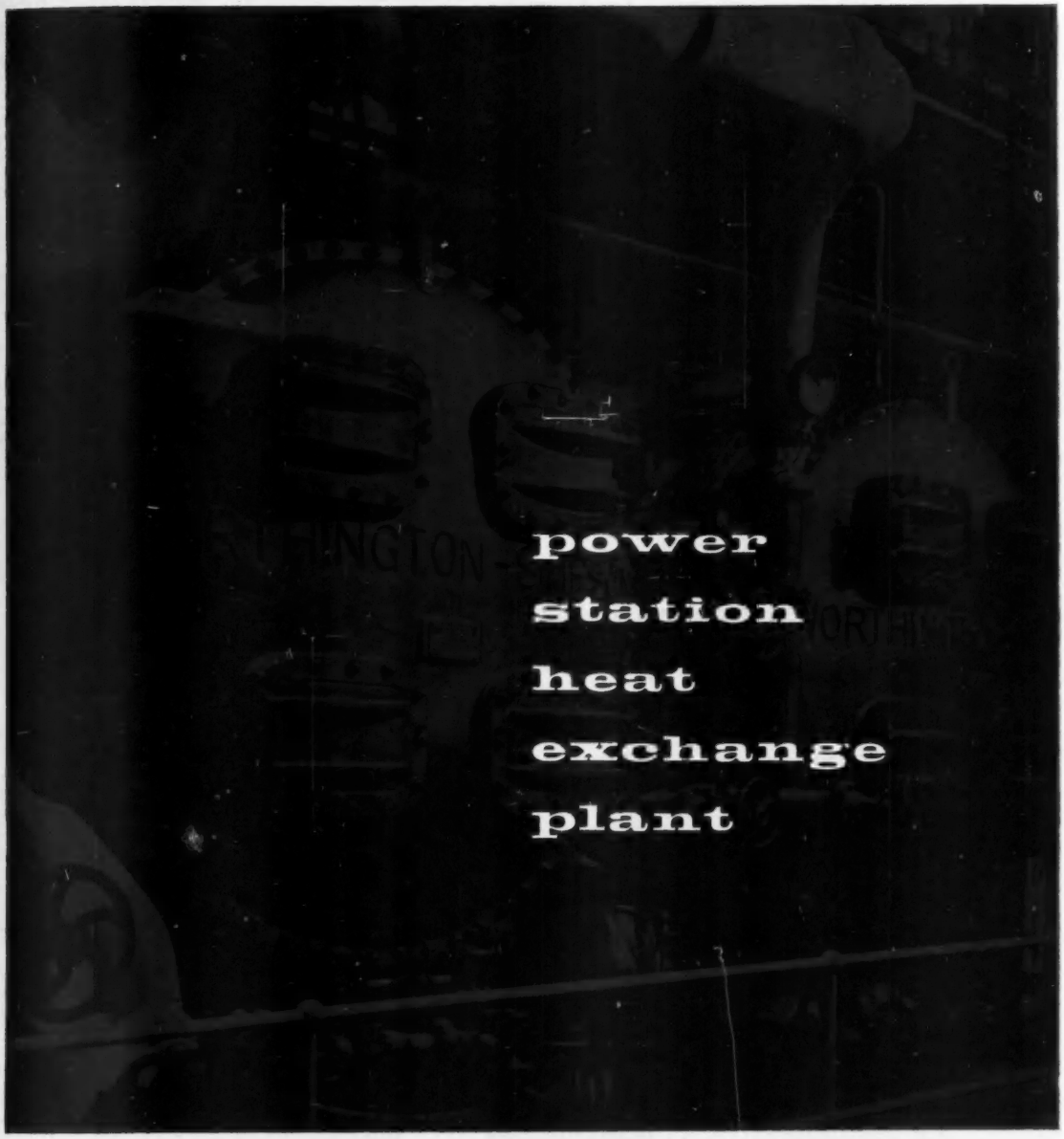

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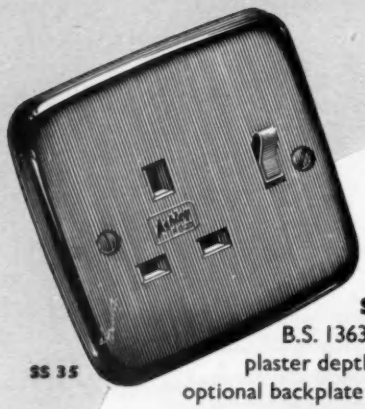
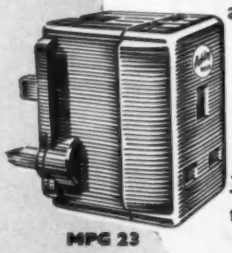


SS 35

S 401

SOCKETS & SWITCHSOCKETS. B.S. 1363 & 2814. Brown or Cream. Flush, for plaster depth or deep socketboxes. Surface, with optional backplate I.E.E. 207G. Safety shuttered. Quiet switch, silver contacts, nylon pad.

FUSED PLUG. B.S. 1363. Brown or Cream. Block terminals. B.S. 1362 Cartridge Fuse-Link, 13 Amp. supplied, 10, 5 or 2 Amp. also available. Optional, High Impact resistant type, Black.



MPG 23

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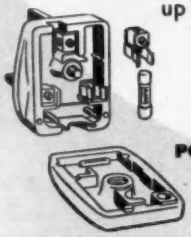
SELECTIVE ENTRY SPUR BOX (Pat.). B.S. 816 3½" dia. x 1½" x 2" fixing centres. Four cable entries, those unused closed by shutters integral with cover. Three block terminals each taking up to four 7/.029 conductors.



PG 13

SK 31

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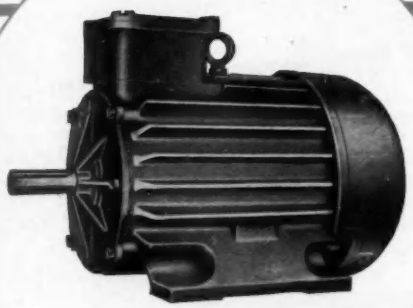

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FOR ALL HAZARDOUS SITUATIONS

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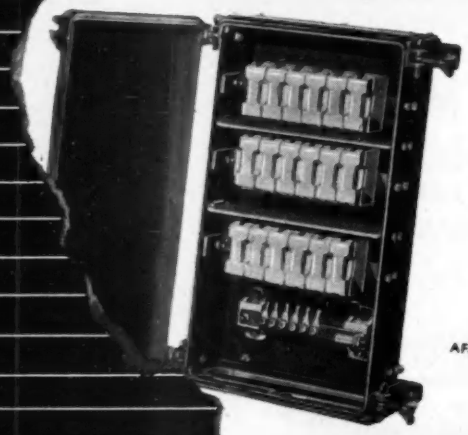
TYPE 'A'

500 VOLT METALCLAD FUSEBOARDS

20—60 AMPS.



AF336N

20 60 Amps. Comply with BSS. 214/1947.

D.P. & N. boards can be supplied at T.P. prices.

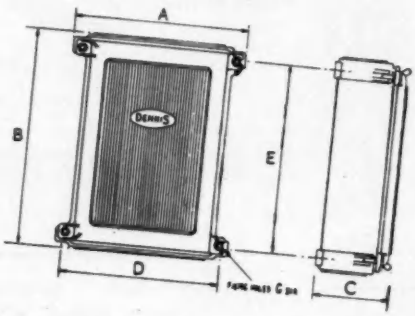
Loose end plates are fitted to sizes 30 amps. and upwards. ¾" and 1" steel knockouts provided on 15 amp. and 30 amp. boards respectively.

Zinc spraying—30 % extra.

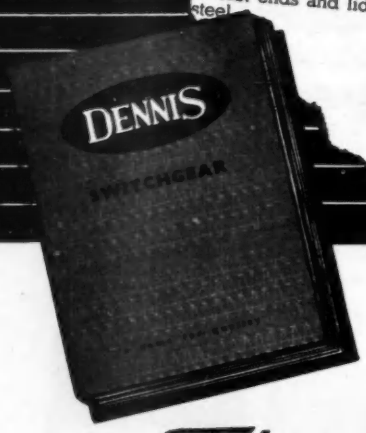
For Cable Glands and Sealing Chambers see page 37.

Padlocks can be fitted.

Fuses are "B" type.



...are composite cases con-...d cast ends and lid. ...steel



List No.	30 amps. DIMENSIONS IN INCHES A	B	C	D	E	G	List No.	60 amps. DIMENSIONS IN INCHES A	B	C	D	E	G
AF132	9½	16½	6½	7½	15½		AF162	10½	17½	8½	9½	10½	
	9½	16½	6½	7½	15½		AF163	10½	17½	8½	9½	10½	
	13½	16½	6½	12½	15½		AF164	14½	17½	8½	9½	10½	
	13½	16½	6½	12½	15½		AF166	14½	17½	9	15½	10½	
			6½	12½	15½		AF168	14½	17½	9	15½	10½	
			6½	18½	15½		AF1610	24½	17½	9½	23½	10½	
				18½	15½		AF1612	28½	17½	9½	23½	10½	
							F262	10½	17½	8½	9½	10½	
							7263	10½	17½	8½	9½	10½	
								16½	17½	9	9½	10½	
									17½	9	15½	10½	
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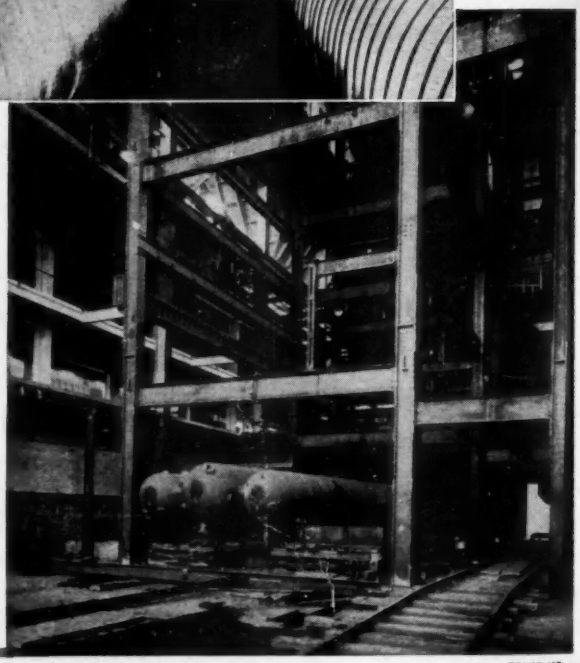

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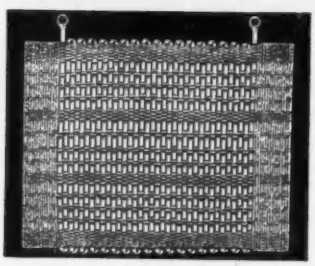

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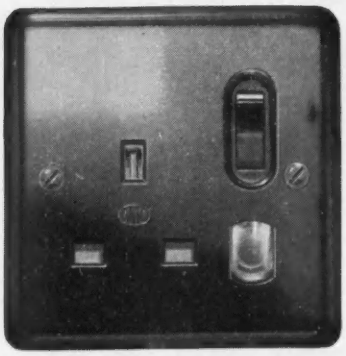

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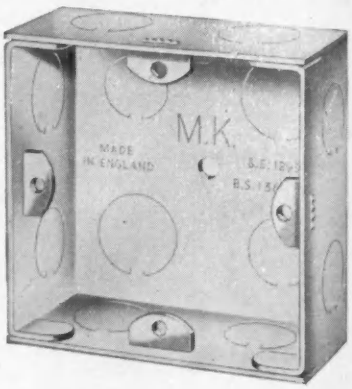

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17 JANUARY 1958

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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It is shown that proposals emanating from the gas industry would have very adverse effects upon electricity supply if they were adopted, without benefiting the public

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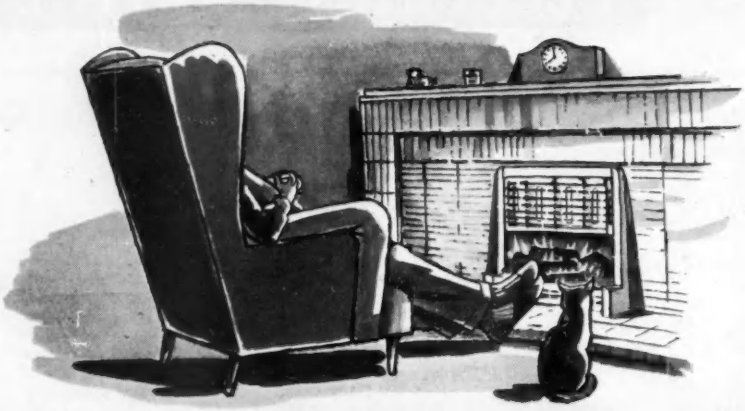

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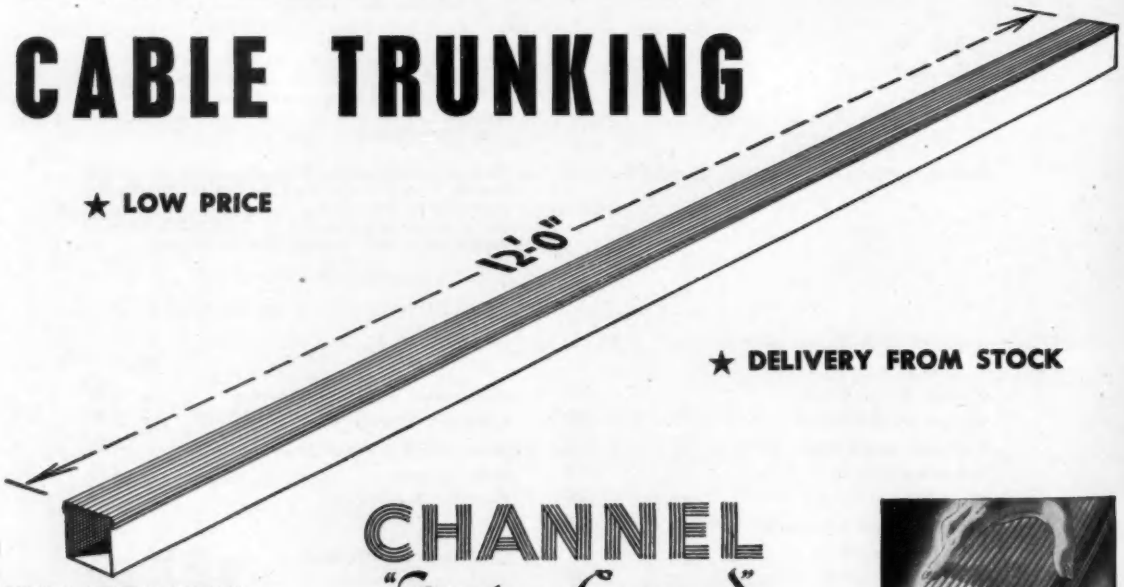

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ELECTRICAL REVIEW

17 January 1958 Vol. 162 No. 3 Established 1872

What Price Co-ordination?

IN the January issue of *Public Service* (the official journal of the National and Local Government Officers' Association) Mr. W. B. McArthur, divisional financial accountant of the Scottish Gas Board, urges the co-ordination of the coal, gas and electricity industries. He refers to " wasted energy, unnecessary competition and unco-ordinated activity in the gas and electricity fields " and considers that the large-scale advertising and publicity " warfare " between the two industries results in rapidly mounting costs. He also comments on the approaches by both to local councils to secure a place on housing estates. Among the measures which he advocates are the sharing of showrooms, the joint purchasing of materials common to both industries, and co-ordinated capital investment planning.

Much is made of " wasteful " publicity but the activities of the two industries in this field are no more wasteful than the advertising of any other commercial concerns. It happens that gas and electricity have been nationalised, but why should it be thought that this makes competition between them wasteful—or even, as is sometimes suggested, wicked? Although Mr. McArthur does not specifically say so, it is implicit in his arguments that co-ordination must mean allocation of business by some over-riding authority. That is, somebody will decide (against the facts) that cooking or heating are better done by gas and therefore electricity should not be used for these purposes. On the other hand lighting should obviously be electric and then, of course, there are radio and television. This may be a *reductio ad absurdum* but it is the trend of thought of many gas people.

What is meant by " co-ordinated capital investment "? Does it simply imply that some (perhaps the same) authority will decide how much each industry should have from a central pool? On what principles would such decisions be made? No doubt the reply would be " the public interest ", but the interpretation of this term varies according to individual beliefs. There are already too many people telling the public what is good for it; in a free society there should be free choice in matters of the kind under consideration.

As is usual in such cases, the fears expressed in the article are grossly exaggerated. The two industries, although providing similar services to some extent, have really little in common. It is also significant that practically all suggestions for co-ordination emanate from the gas industry and they stem from a desire to preserve that industry from further harm, with little regard for the public needs. Let us have no more of them.

B.E.P.C. EXHIBITION

Because there was some doubt in the early stages whether there would be an exhibition at this year's British Electrical Power Convention (Brighton, 16th-20th June) it seems that a number of would-be exhibitors are still a little confused. For their benefit we may repeat that there *will* be an exhibition and that, as usual, the organisation of the display will be in the hands of the British Electrical Development Association, 2, Savoy Hill, London, W.C.2.

The Association is naturally anxious to proceed with the arrangements and it must know within a reasonable time how many to cater for. As most exhibitors know, an exhibition of this kind requires a good deal of forward planning. Such excellent displays as those achieved by E.D.A. at previous Conventions are not last-moment affairs. We suggest, therefore, that interested firms or associations should move now to secure their places in the Brighton exhibition.

AUTOMATIC CONTROL ACCIDENTS

The annual report of the Chief Inspector of Factories for 1956 includes a new section covering accidents occurring in connection with automatic equipment. The anticipated possible risk with automatic control, namely unexpected starting, has been underlined by one or two accidents due to this cause. The provision of isolating switches at the machine would help to prevent unexpected starting from a remote push-button.

But perhaps a better solution is to arrange the control devices so that if any particular stage fails to work properly, no other sequences can follow until the faulty stage has been rectified, and the plant will not restart automatically. As well as providing protection against the above-mentioned difficulties with remote control, this would also prevent unexpected resumption of automatic operation. With small extra outlay, it should be possible to provide, in addition, a monitoring system separate from the automatic machinery.

SPHERICAL MOTORS

Variable-speed drives are required for many industrial applications. The simplest method of obtaining a variable speed drive is to use a d.c. motor but since a.c. supplies are now universal a certain amount of complication arises. Thus there is a need in industry for a variable speed a.c. motor which is cheap, simple, easily maintained and reliable. It is not an easy matter to design a variable speed a.c. drive since either the machine itself becomes complicated with brushgear, commutators and special windings, or some external equipment is required which may cost more than the machine itself. A step in the right direction has recently been made, however, and a variable speed induction motor requiring no complicated external control gear has been designed.

This machine has been fully described in a number of recently-published I.E.E. papers and in this issue Dr. E. R. Laithwaite explains the operating principles. He says that sufficient work has been done on the development of spherical motors for it to be clear that they can be designed to have efficiencies and power factors comparable with fixed speed induction motors of the same size and pole numbers. The indications are that spherical motors will have a higher power/weight ratio and lower costs per horse-power than any other type of variable speed electric motor.

COSTS AND PRICES

The Treasury's "Bulletin for Industry" for December showed how the prices of many important commodities have fallen during the past year or so. For instance, in October last the price of copper fell by 34 per cent from the October, 1956, level; lead was 26 per cent down and tin 9 per cent.

It is, perhaps naturally, being asked why the prices of finished articles are not being correspondingly reduced. The answer so far as most electrical appliances are concerned is that the "labour" content represents a much greater part of the cost than the actual materials. Labour costs are still rising and during 1956 home costs per unit of output were 6½ per cent higher for goods and services as a whole. The "Bulletin" says that the 1957 increases in wage rates, iron and steel prices and transport costs (which themselves are caused by higher wages) "are still working themselves through industry, and it is too early to say to what extent they will be offset by the fall in prices of imported materials."

ELECTRIC RAILWAY OPERATION

Estimates of the economic advantages of changing from steam to electric working on the railways have always allowed for a consequent saving in labour costs. The extent of this saving was assessed by Mr. G. H. Fletcher (whose death we regret to say occurred recently) in his Faraday Lecture at about 50 per cent of the running costs. This estimate took into account the considerable reduction in the number of locomotives needed under electrification owing to their much higher availability, in addition to the elimination of the firing and routine maintenance of boilers. Also the effect of lessened liability to wheel slip, due to the greater number of driving wheels, would ease the task of the locomotive drivers.

As the present scheme is expected to take 15 years to complete, such economies could be secured only gradually as Sir Brian Robertson pointed out recently. Many of them would apply to diesel-electric working, as shown by experience in the United States, which was described by Mr. G. H. McClean in our issue of 27th December.

TRANSFORMER OIL

Doubts expressed during the discussion of the I.E.E. paper by Dr. Hancox and Dr. Tropper as to the practical value of breakdown tests on filtered oil under impulse voltages do not detract from their value as a piece of long-dated research. Although the pre-treated oil tested was of a purity unlikely to be found in service, the authors put forward a number of suggestions the validity of which should be well worth further investigation in the light of other work of a similar character, as that in hand at Manchester University. As with so many research activities, it is often indirect results that yield ultimately the greatest advantage.

Brushless Variable-Speed Motor

Development of an Induction Machine Based on a New Principle

By E. R. LAITHWAITE, M.Sc., Ph.D., A.M.I.E.E.*

SO-CALLED developed diagrams of winding arrangements in electrical machines are often used to display in a plane an arrangement of wires, which in practice is situated around the surface of a cylinder. What a developed diagram suggests is that the real motor as represented by the model shown in Fig. 1 (a) has been cut open and rolled out flat, as shown in Fig. 1 (b). If a motor stator is actually built in the form shown in Fig. 1 (b), the system of coils carrying polyphase alternating currents produces a *travelling* magnetic field instead of the more usual *rotating* field of the conventional machine. Conducting material placed on the surface of such a stator tends to be accelerated towards the synchronous speed of the field v_s which is given by:

$$v_s = 2pf \quad \ldots\ldots (1)$$

p being the pole pitch, and f the supply frequency.

Such a device may be termed a "linear" induction motor. This type of motor has been successfully applied to pumping liquid metals[1] and has also been proposed as a shuttle-propelling device in weaving looms.[2] A simple linear motor stator may be used to spin a disc by offering it up to the disc surface as shown in Fig. 2 (a). Providing the radius of the disc is large enough for the surface velocity under the stator block to be considered linear, the rotational synchronous speed is given by $\frac{v_s}{r}$. If the whole block is moved inwards towards the disc

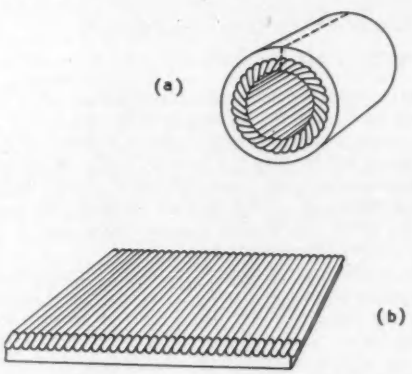


Fig. 1.—"Development" of a linear motor

centre, as in Fig. 2 (b), it is clear that the synchronous speed of rotation must increase, ideally to $\frac{v_s}{r'}$. What is not so easy to understand is the reaction of the parts of the disc as at A and C, where the velocity of the disc is directed at an angle to the velocity of the field.

Consideration of the system shown in Fig. 2 led to the discovery of a new principle of induction motor action[3] which may be stated as follows:—If the rotor of an induction motor be constrained to move in a direction making an angle θ with the direction of the field velocity, the ideal running light speed is given by $\frac{v_s}{\cos\theta}$. Fig. 3 illustrates how the principle may be applied to a disc motor. The stator block at radius r in Fig. 3 (a) when turned through an angle θ, as in Fig. 3 (b), produces ideally the same running light speed as if it had been physically transferred to a radius r′ where $r' = r\cos\theta$. In practice, it was found that the wider the poles in relation to the pole pitch, the more nearly was the ideal speed achieved. This may be explained in several ways, perhaps the simplest of which is to consider the motion of the disc resolved both in the direction of the field velocity and at right-angles to it. The cross-component of velocity sets up braking currents which must be minimised if the ideal speed is to be approached and this is achieved by increasing the pole width/pole pitch ratio. The torque on the rotor is proportional to $\cos\theta$, other things being equal, so that the power tends to remain constant.

The new principle may be also regarded as a new type of pole-changing device, allowing gradual changes in pole pitch to be effected, as shown in Fig. 4. A point travelling in step with the field from A to B moves with velocity governed by pole pitch p in equation (1). If

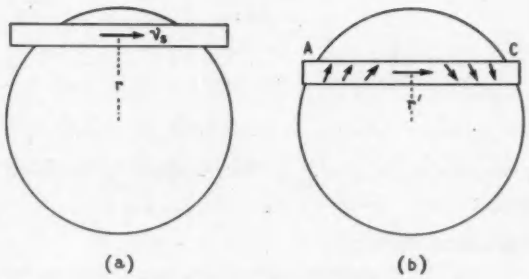


Fig. 2.—Disc model of a variable speed motor

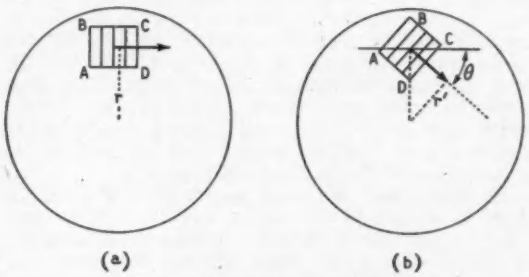
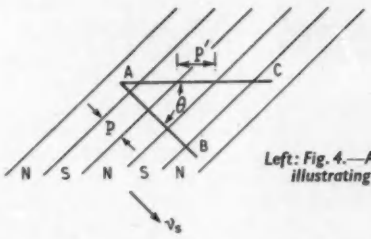


Fig. 3.—Model demonstrating the new principle

* University of Manchester.



Left: Fig. 4.—An alternative diagram illustrating the new principle

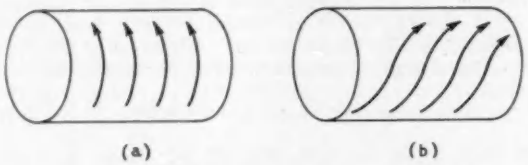


Fig. 5.—Change of field direction on a cylindrical surface

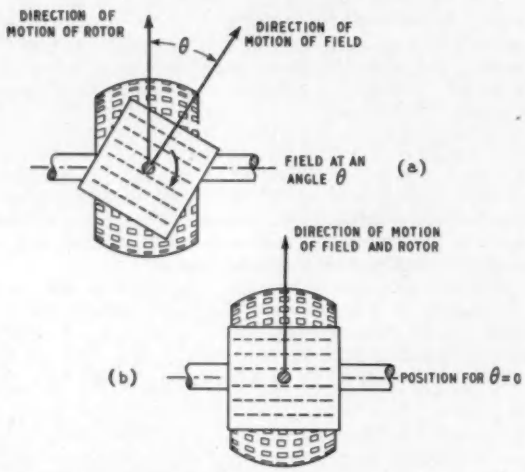


Fig. 6.—Arrangement of rotor and stator in a spherical machine

the point is constrained to move along AC, the effective pole-pitch is now $p' = \frac{p}{\cos\theta}$ and the speed appropriately higher.

Spherical Motors

Of the several disadvantages of disc-type machines, the most serious is illustrated by Fig. 3 (b). As θ is increased the edge AD of the stator block will be directed towards the centre whilst the edge BC is still directed at quite a large radius. Further increase in θ results in parts of the field near the edge AD attempting to drive the disc in the opposite direction to the parts near the edge BC with resultant loss of torque and efficiency. This effect is only minimised by using very small blocks on comparatively large discs. The small pole-pitches needed to ensure a good "width-to-pitch" ratio on small blocks results in loss of efficiency and power factor.

In conventional induction motors the stator field is made to operate on the edge of the disc, the disc then being extended into a cylinder. A cylindrical construction is not possible if the angle between field and rotor velocities is to be variable by movement of the stator. Fig. 5 shows the required change in field direction. Any

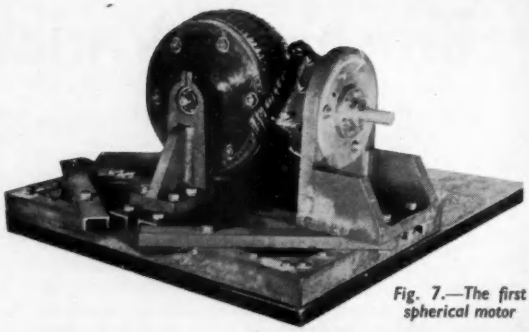


Fig. 7.—The first spherical motor

movement of the stator towards this end would cause immediate mechanical contact between rotor and stator. If the rotor is made in the form of part of a sphere, however, a stator block with a spherical inner surface can be used, several such blocks being mounted around the periphery.

An important condition imposed upon rotor construction in this type of machine is that the pattern of rotor currents must be sensibly the same as that of the stator currents for all running conditions and this implies that the rotor must be capable of conducting in any direction. The rotor surface must in fact approximate to a conducting sheet.

Fig. 6 shows the basic form of construction of a spherical motor in which the rotor carries a network of conventional rotor bars connected solidly to peripheral conducting rings to make a network which behaves sensibly like a conducting sheet. The earliest form of spherical motor to be built was constructed in this way and is shown in Fig. 7. The rotor had a diameter of 14in and a speed range of 3·3 to 1 was achieved with this machine. Measurement of power output and efficiency revealed some unaccountable losses which were thought to be due to faulty manufacture, until a second machine was made which further accentuated the "missing watts," as the extra losses were then being called.

Short Stator Effect

Some time elapsed before the missing watts were traced. Fig. 8 shows the nature of the phenomenon. The difference between input, less stator copper loss ($w - I^2R$), and synchronous watts ($T\omega_s$), where T is the torque and ω_s the synchronous speed, is normally accredited to iron loss and stray load loss. The curious form of this quantity shown in curve (d), Fig. 8, cannot be explained on the basis of either of these phenomena.

The construction of spherical motors, like that of the disc machine shown in Fig. 3 involves a new feature, in addition to the facility of being able to rotate the field about an axis relative to the rotor. This new feature is that the stator is essentially divided into blocks, and the travelling field is not continuous around the periphery of the machine. To simplify the analysis, a single stator block, such as that shown in Fig. 9, is considered first with the rotor driven at synchronous speed. A rotor tooth in the position A carries virtually no flux as it moves towards the entry end of the stator block. Immediately before entry it carries no flux and is subsequently brought very rapidly under the stator block to the position B. This tooth, like all the other teeth, is surrounded by a conducting loop which prevents any instantaneous build-up of flux. The tooth and its associated short-circuited loop behave, in fact, like the core of a slugged relay. Current equal and opposite to

the stator current flows in the rotor and no flux results. The presence of rotor current implies a rotor resistive voltage drop which must be maintained as long as rotor current flows. Since the rotor is travelling at speed ω_s there is no flux cutting and therefore no mechanism of induced voltage, except by a rate of change of flux. This ideally constant rate of change of flux necessary to maintain rotor current results in a linear flux build-up as the tooth progresses further under the block, the flux density at any position such as C being proportional to the distance between B and C. This flux is wholly in quadrature with the current and incapable of producing torque. The result of the transient introduced by the edge of the

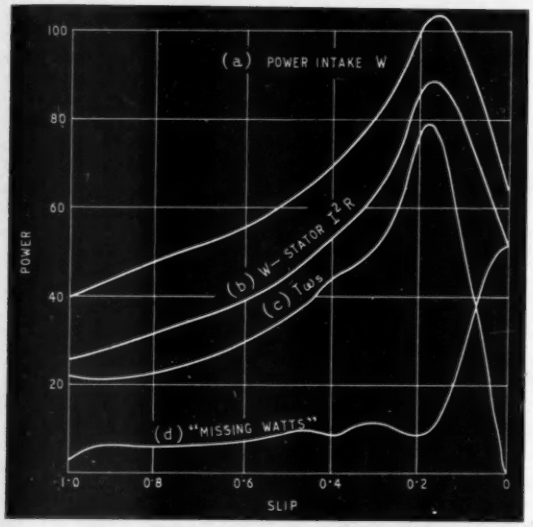


Fig. 8.—Results of brake test at constant current

stator block is that rotor current and rotor copper loss exist without any torque being produced—a source of hitherto unaccountable loss.

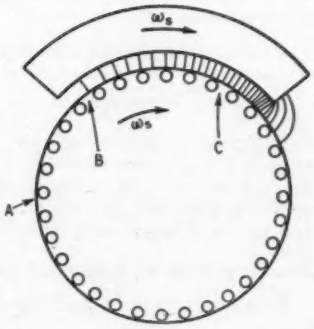
When the rotor slips, the conditions are more complex. These conditions have been analysed fully[4] but space permits only the results to be quoted here. The flux density at any position along the block may be resolved into a quantity Bp in phase with the stator current, which is torque-producing, and a quantity Bq in quadrature with the stator current, which is non-torque producing. The flux densities shown in Fig. 10 are calculated on the basis of a constant stator current.

The operation of "short stator" machines is clearly quite different from that of conventional induction motors. Every part of the short stator machine is working at all times (except at standstill) under transient conditions. No equivalent circuit can be derived to represent the operating conditions and the design of such machines must be undertaken on quite a new basis. A useful comparison between a short stator machine and a conventional motor can be made, using Fig. 10, provided on "equivalent conventional machine" is first defined. Fig. 11 provides such a definition. The equivalent conventional machine has the same synchronous speed and radial dimensions as the short stator machine, but its axial length is only $\frac{\alpha}{360}$ times that of the short stator machine so that the nominal power ratings of the two machines are the same.

The dotted lines in Fig. 10 indicate the value of Bp in the equivalent conventional machine. For a slip of $\frac{1}{17}$ the power output for a given current density, and therefore given losses, is represented by the rectangle ABCD for the conventional machine, in place of the smaller shaded area for the short stator machine. Under these conditions, therefore, "missing watts" result and the short stator machine is the less efficient. For a slip of $\frac{1}{9}$ the outputs of the two machines are equal (no missing watts), whilst a slip of $\frac{3}{19}$ is seen to produce negative missing watts, i.e. the short stator machine is more efficient (at least on this account) than the conventional machine.

The effect so far described is the result of the transient

Right: Fig. 9.—The "short stator" effect



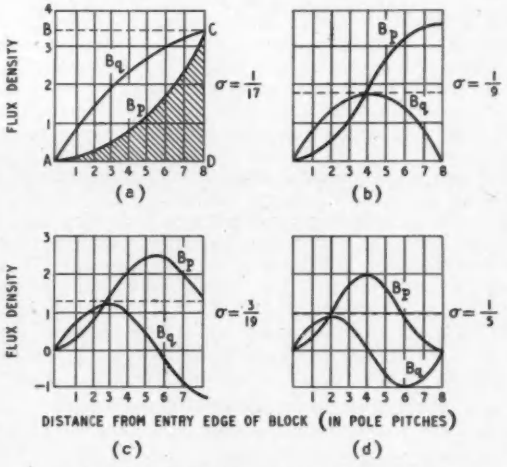


Fig. 10.—Flux distributions under a short stator block

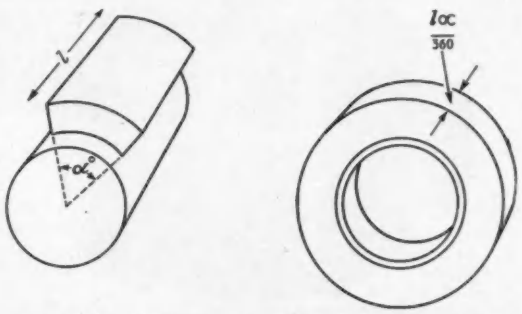


Fig. 11.—The definition of an "equivalent conventional machine"

at the entry edge of the stator block. Fig. 9 illustrates that a second effect occurs at the leaving edge where the short-circuited rotor loops prevent the decay of flux as the teeth leave the block. This effect also contributes to the missing watts. The power loss may be regarded as magnetic energy carried away by each rotor tooth and dissipated as rotor copper loss *outside* the stator block. Whenever there is a flux present at the exit edge, there is a power loss from this effect. Fig. 10, however, shows that for a slip of $\frac{1}{5}$ there is no flux at exit and no net Bq over the whole block. In this condition the machine is indistinguishable externally from the equivalent conventional machine. The particular case shown in Fig. 10 for an eight-pole block may be generalised for an n-pole block as follows:—

Condition for no extra entry edge losses, slip $(\sigma) = \frac{1}{n+1}$

Condition for no extra exit edge losses, $\sigma = \frac{2}{n+2}$.

It should be emphasised that the above results apply only to the ideal machine with infinitely permeable iron and no air gap. Nevertheless, these conditions are not seriously disturbed by the introduction of a reasonable proportion of magnetising current.

Performance of Spherical Motors

Design is at present based on a preferred slip of $\frac{1}{n+1}$, the penalties for increasing the slip to $\frac{2}{n+2}$ outweighing the advantages. Under these conditions the output is limited to n times the rotor copper loss, where n is the number of poles on a stator block. It follows that for a high power/weight ratio, n should be large. The result is that spherical motors are essentially low-speed machines at power frequencies and are probably best suited to high-powered drives such as pit hoists and rolling mills, although small machines down to 1 h.p. are known to operate successfully. Recent designs of spherical motors have tended towards a two-block type of construction, as shown in Fig. 12, rather than the earlier multi-block type of construction. Machines of the type shown in Fig. 12 with rotor diameters of 14in have achieved the following performance figures at 50 c/s:—Output 14 h.p.; efficiency 72 per cent; power factor 0·7; and maximum speed range 5·5 : 1. The maximum speed range is not a true working range as the efficiency is very low at top speed. A 2 : 1, or even 3 : 1, range is thought to be economical, however, the fall in efficiency with speed in an experimental machine being as shown in the following table:—

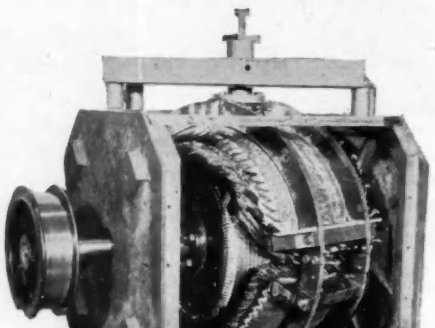


Fig. 12.—Two block type of construction (14in diameter rotor)

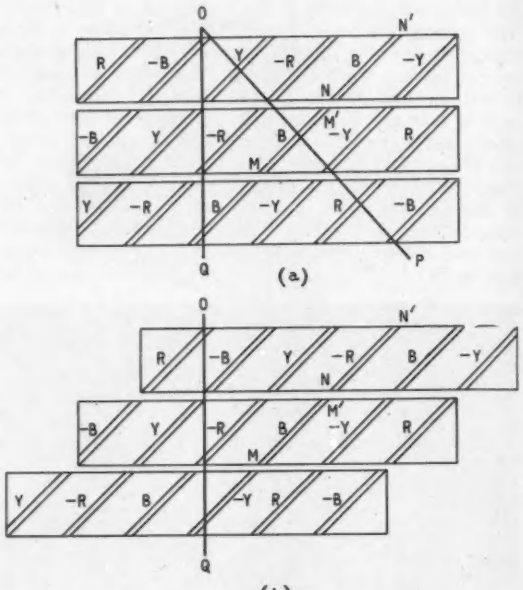


Fig. 13.—Principle of phase-shift operation

	Percentage Efficiency	Power factor
375 r.p.m.	70	0·7
500 r.p.m.	72	0·7
750 r.p.m.	61	0·7

Larger machines would produce better efficiency and power factor due to increased pole pitch and more constant efficiency over the range due to increase in pole numbers. Present development work is concerned with the design and manufacture of a 30in diameter rotor machine to deliver about 200 h.p.

The Phase-Shift Idea

There exists a second method of changing the effective angle between the direction of motion of the travelling field produced by the stator and the direction of motion of the rotor. Fig. 13 (a) shows a set of three stator blocks, each wound with a three-phase winding, set in slots at 45 deg to the axes of the blocks. The effect of the m.m.f.s due to the three sets of coils in any one block may be said to constitute a field travelling along the block. It is more correct, however, to regard the basic velocity of such a system to be the velocity calculated from the *minimum* slot pitch, which is therefore measured at right-angles to the slots along a line such as OP. A rotor constrained to move along OQ is acted on by an m.m.f. on account of the coils having a slot-pitch larger than the basic.

If the three blocks are physically displaced from each other, as shown in Fig. 13 (b), then the rotor moving along OQ observes more rapid changes of phase in a given distance and therefore a slower speed. If, on the other hand, the blocks are displaced in the opposite sense, an increase in synchronous speed along the line OQ

results. The blocks may be moved so that adjacent slots such as MM′, NN′, which initially carried the same phase of current now carry currents displaced by 60 deg. The same result can clearly be achieved by reconnecting the blocks and leaving the iron undisplaced. Similarly, if the different blocks are fed from separate phase-shifting transformers, any effective displacement of a particular block may be achieved simply by changing the phase of the supply to that block. What in fact has been achieved is that the helical field of Fig. 5 (b) has been set up such that the angle of the helix can be varied.

An experimental machine of this kind has been made and a 3 : 1 speed range obtained. Further investigation of the properties of this type of motor is going on with a view to assessing its commercial value. Although the cylindrical form of construction has been retained, the disadvantage of the system is that additional phase-shifting regulators are required. The phase-shift motor may possibly be a high-speed motor, whereas the spherical motor is essentially low speed. An interesting parallel may be drawn between variable-speed a.c. commutator motors which are fed either through fixed brushes from a voltage regulator or from the mains via movable brushes, and the two new types of brushless motor employing the " angled-field " principle.

Sufficient work has been done on the development of spherical motors for it to be clear that these machines can be designed to have efficiencies and power factors comparable with fixed speed induction motors of the same size and pole numbers. The indications are that quite apart from the many advantages of a brushless machine, spherical motors may have a higher power/weight ratio and lower cost/h.p. than any other type of variable-speed electric motor. The development of the phase-shift motor is in too early a stage for similar comments to be made. The new motors may possibly become known as " continuously variable pole-pitch " motors since they then fit naturally into the pole-changing class of motor which hitherto has been concerned only with integral steps of speed change.

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Large Canadian Aluminium Smelter

LESS than 20 months after work commenced on clearing the site, the first metal was poured last month at the new aluminium smelter of the Canadian British Aluminium Company at Baie Comeau. The event marked the completion of the first of four production stages of the £50 million plant which will eventually have an annual capacity of 160,000 long tons of virgin aluminium ingot. As an indication of the size of the smelter, this ultimate capacity represents two-thirds of the present annual consumption of virgin aluminium ingot in the United Kingdom.

A wharf capable of berthing three 10,000 ton ships has been built, with a belt conveyor system 3,000ft long to carry raw materials, such as petroleum coke and alumina, from the dockside to the smelter. At present the conveyor handles about 125 tons of coke and alumina per hour and its capacity is designed so that this may be raised to 400 tons hourly. Substantial storage space is required owing to the period of closed navigation on the St. Lawrence, making it necessary to store materials for approximately a four-month period.

Designed to be one of the most modern aluminium reduction works in the world, it is provided with a high degree of mechanisation and automatic control. The two furnace rooms for stage 1 of the smelter are more than 1,700ft long with a rectifier house at one end and a casting shop at the other. In addition, the plant comprises a carbon factory, laboratory, service building, workshops and offices, together with alumina and coke silos. Each furnace room has 84 furnaces of the vertical stub Soderberg type, connected in series. The aluminium production process requires about half a ton of carbon for every ton of metal produced. This is supplied at Baie Comeau from a carbon factory and the two main products are carbon paste for the anodes of the furnaces and the carbon mixture for lining the furnaces. The plant is designed so that exceptionally close control can be exercised over its operation and operating labour reduced to the minimum by the centralisation of all controls into one control room.

Power for the present requirements of the smelter is supplied from the hydro-electric installation of the Manicouagan Power Company, eleven miles away, where a major extension programme has just been completed to serve the new smelter, involving an extension of the McCormick Dam and the installation of three new 50,000 h.p. generators. Quebec Hydro is building a large storage dam some miles up the Manicouagan River at Lake St. Anne to provide a regulated water supply throughout the year for this expansion. Agreements between Quebec Hydro and C.B.A. have been completed for the remainder of the company's power requirements.

Transmission is at 161 kV to C.B.A.'s outdoor switchyard, where air-blast switchgear and 115 MVA transformers, of English Electric Co. manufacture, transform the supply to 33 kV for the furnace rectifying equipment and 13·2 kV for the works distribution supply. The rectifying equipment for each furnace room comprises eight British Thomson-Houston rectifier banks, each consisting of 18 individual pumpless steel tank mercury-arc rectifiers. The works distribution supply is taken from a 13·2 kV, 15 MVA ring main which interconnects the five works distribution substations providing the 550/110 V supplies for auxiliary power and lighting.

Faraday Lecture

THE Institution of Electrical Engineers announces that, following the death of Mr. G. H. Fletcher, arrangements have been made for Mr. R. Ledger, B.Sc.Tech., A.M.I.E.E., A.M.I.Loco.E., to deliver the Faraday Lecture as arranged for the rest of the 1957-58 period. Mr. Ledger is deputy chief designer in the Traction Motor Department of the General Electric Co., Ltd., Witton.

Superheater Tubes and Supports

THE PROBLEMS OF MATERIAL CHOICE

THE trend towards higher steam temperatures and the deterioration in the quality of fuel oil have made the choice of suitable materials for superheater tubes and supports one of the most pressing problems of design. In a paper read on Tuesday, 14th January, before the Institute of Marine Engineers, Mr. D. W. Crancher said that six steels with the necessary properties of creep and corrosion resistance in both steam and flue gas atmospheres; of adequate mechanical strength at room temperatures; possessing ease of welding and adequate strength of welded joints, as well as availability, had been developed in this country covering as far as creep strength was concerned a range of metal temperatures up to 1,230 deg F.

Discussing the properties of these steels in detail the author reached the conclusion that mild steel should be used whenever possible up to its temperature limits, although it sometimes had poor creep resistance, which could cause difficulty if tube expanding were used. An alloy of 0·5 per cent molybdenum had failed, either owing to graphitisation or to low creep ductility and its use was now seldom recommended. On the other hand, an alloy containing 1 per cent chromium and 0·5 per cent molybdenum was an excellent material and should be employed to the fullest extent.

New High-Temperature Steel

A steel, which was relatively new to this country, contained 2·25 per cent chromium and 1 per cent molybdenum. It possessed excellent creep ductility, but required careful heat treatment and was more difficult to weld than the 1 per cent chromium, 0·5 per cent molybdenum alloy. It was therefore best used at the higher temperatures. An alloy containing 0·5 per cent molybdenum and 0·25 per cent vanadium was a pipe rather than a tube steel. Its very high creep strength, however, made it useful for high-temperature work. Austenitic steel of the 18-12-1 Cr-Ni-Nb type was the cheapest and simplest material that could be safely recommended for conditions too severe for the best low alloy ferritic steel.

Wastage and Fouling

Wastage of superheater tube supports and fouling of tube banks were problems about which evidence was confusing. Ash attack might become serious as metal temperatures approached 1,150 deg F. Higher temperatures also seemed to be a factor in causing fouling, probably because the temperature of the tube was sufficiently high to maintain the ash in a sticky, semi-molten state. Partial remedies for these conditions were the use of easily replaceable supports, burying the supports in refractory and water cooling. No known metallic alloy would withstand ash attack and fouling; and the obvious approach was to treat the fuel so as to inhibit both actions. This could be done either by removing the sodium by washing and centrifuging or, where the vanadium content was high, by employing additives.

Marine Gas Turbo-Generators

IN a paper presented before the Institution of Mechanical Engineers on 10th Janua-y, Mr. A. W. Pope (W. H. Allen, Sons & Co.) gave particulars concerning the design and development and putting into operation of four light-weight high-speed marine gas turbines for driving electric generators. Three of these, of 1,000 and 500 and 125 kW, were built for the Admiralty, the largest two for base load operation in a tropical ambient temperature of 100 deg F and the smallest for emergency use. The fourth unit of 350 kW was supplied for standby service in the Merchant Navy, mainly to increase cargo space through the elimination of one of the existing diesel engines.

The 1,000 kW set has an axial-flow compressor of 4¼ to 1 pressure ratio driven by a two-stage turbine, a multiple-chamber combustion system, an annular two-pass cross-flow heat exchanger and a separate single-stage power turbine. It has run for 4,000 hours satisfactorily except for the heat exchanger, which requires modification for securing greater flexibility so as to accommodate temperature expansion and to obviate corrosion of tube material, originally aluminium bronze. Without heat exchanger the engine would be suitable for standby and peak load duties, particularly if turbine blade material were changed from Nimonic 80 A to Nimonic 90, permitting the raising of the turbine inlet temperature from 1,328 to 1,436 deg F and the corresponding electrical output under tropical conditions to 1,250 kW and under temperate conditions to 1,500 kW.

For the 500 kW set, which was required to weigh two tons and to have a minimum thermal efficiency of 20 per cent, a compound arrangement was chosen with an inter-cooler to obtain stability. The compression ratio is nearly 10 to 1 to allow of a maximum inlet temperature of 1,292 deg F and a specific fuel consumption of 0·95 lb/kWh. Under tropical conditions with air at 100 deg F and sea-water 85 deg F, the inlet temperature rises to 1,436 deg F at full load with a specific fuel consumption of 1·05 lb/kW.

Fuel consumption being unimportant for the 125 kW emergency set, the turbine is a single-stage radial-flow simple design with a compression ratio of 2·5 to 1, and the rotor forms part of one ferritic steel forging with the centrifugal compressor. This engine was run for 600 hours at inlet temperatures of 1,346 to 1,382 deg F and for 300 hours at 1,382 to 1,472 deg F. The rotor is considered satisfactory for use below 1,382 deg. The paper gives particulars of various methods adopted to deal with outstanding problems encountered during design and development.

A second paper read by Mr. D. A. Drew (Rolls-Royce) described recent developments in methods of measuring stresses in compressor and turbine blades.

Factories in 1956

Annual Report of H.M. Chief Inspector

IN the annual report of the Factory Inspectorate Department of the Ministry of Labour and National Service for the year 1956 Sir George Barnett, the former H.M. Chief Inspector of Factories who retired on 31st December, mentions that the accident rate was the lowest yet recorded, the index being 87·1 (1950 taken as 100). The number of accidents decreased from 163,332 in 1955 to 160,116 in 1956 while the factory population increased by 0·4 per cent and the number of factories with mechanical power decreased from 213,833 to 211,924. The number of fatal accidents in factories was 426 which continues the downward trend noted since 1951.

A rapid growth in the industrial use of radioactive materials is referred to in the report and an expert committee was formed to examine a draft Code of Regulations which had been in course of preparation. As a result, draft regulations in respect of sealed sources of radioactive materials were nearly complete by the end of the year and have since been published; these regulations cover all known industrial uses in current practice or projected in the future. The preparation of a draft Code of Regulations for the remaining unsealed sources is under consideration.

Safety Measures

The report reviews recent developments in the design of machinery, the use of electrical and electronic control equipment, and safety in the Calder Hall nuclear power station. Electrical and electronic control apparatus is increasingly replacing mechanical control systems. From the point of view of safety of operators, this means that great reliability is required of such apparatus, for failure may lead to unexpected and dangerous movement. It is frequently all too easy to apply a guard which controls the electrical circuit through a limit switch, but it may well be that with a little more effort and thought the control could be exercised much nearer to the mechanism which is finally responsible for the machine movement. Thus, in the case of electro-hydraulic controlled machinery such as injection moulders, a guard-controlled by-pass in the hydraulic circuit is a much better arrangement than one which merely deals with the electrical control circuit. In addition, great importance is attached to the incorporation of some simple form of "automatic monitor" as an additional safeguard.

Usually, the automatic monitor can be very much simpler and more reliable than the device it is checking, and in this lies the particular merit of this form of safeguard. Thus, a process controller governing the flow of liquid into a tank may have a task to perform which is based on complicated mathematical considerations, but the automatic monitor need only be a high-level alarm, and can thus be cheap, robust and reliable.

It is perhaps to be expected that accident prevention should be making better progress in the case of men. The industrial experience of most women in industry is fairly short and it is these inexperienced workers entering industry for the first time who need special care. In 1956 the accident rate for women and girls improved slightly but was still higher than the rate for men.

The total number of electrical accidents reported under the Factories Act, 1937, during 1956 was 797, of which 40 were fatal compared with 736 (42 fatal) in 1955. The figures over the past decade show no marked increase, in spite of the greatly increased use of electricity in industry during recent years. Of the 40 fatal accidents, 23 occurred where the voltage was below 250 V a.c. The number of electrical accidents involving electric shock, with or without the accompaniment of burns, was 333. The number of electrical accidents involving burns, with or without shock, was 432, and the number of accidents involving shock and burns together was 156. These figures may serve to correct a common misconception as to the nature of electrical accidents, the fact being that the total incidence of burns is greater than the total incidence of electric shock.

Five of the 40 electrical fatalities were the result of falls following electric shock, four men died of burns and one was killed by an explosion. Of the remaining 30, twenty-three received artificial respiration for periods between ten minutes and three hours but in seven cases there was a delay in starting; in two cases the delay was twenty minutes and in one case it was half-an-hour. Of the non-fatal electrical accidents, there were thirty-three where it was recorded that a man was unconscious and in eighteen of these artificial respiration was applied for periods up to twenty minutes. The remaining fifteen men recovered without assistance, but as at least six of these are known to have recovered in five minutes or less, they were presumably not deeply unconscious.

One of the most important facts which emerge from the report, regarding electrical accidents, is that portable electrical apparatus of one sort or another is responsible for nearly half the electrical fatalities and for about a third of the total electrical accidents. A weak point is the switch in the handle of the portable tool, and it is here that a number of earth faults, which cause fatal accidents, occur.

A number of accidents have occurred involving severe burns to employees working on internal high-voltage distribution systems in factories. Some of these accidents reveal a surprising lack of appreciation of the hazards involved, and a complete disregard for the safeguards which experience shows to be vitally necessary to prevent work being carried out, in error, on live conductors.

Swiss Import Exhibition

THE second Swiss Import Exhibition (Z.U.S.P.A.) will be held in Zurich from 30th May to 8th June, 1958, and will be devoted to capital and technical equipment. The *Board of Trade Journal* reports that the exhibits will include precision instruments, electrical equipment, batteries and accumulators, switchgear, measuring and control apparatus, heating equipment, mechanical handling and internal transport equipment.

Only Swiss firms may exhibit but all exhibits must be imported. As foreign exhibits are normally excluded from Swiss national fairs, this exhibition provides an opportunity for British firms to show their products in Switzerland through their Swiss agents. The exhibition is organised by the Genossenschaft Zürcher Spezial-Ausstellungen, Nordstrasse 20, Zurich.

Automatic Train Control

Review of Electrical Systems

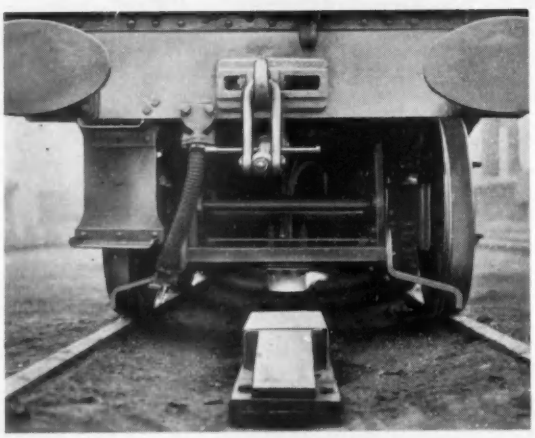
By B. K. COOPER*

NAMES such as Reliostop, Railophone and SYX recall to the student of railway signalling the continuous and varied efforts which have been made to guard against the over-running of signals by trains in bad visibility. The fact that these systems are all but forgotten to-day is a reminder of how transitory most experiments in this direction have been. Only two forms of automatic train control (A.T.C.) have seen extended operational use in this country so far. The train stops used on the Underground system do not fall into this category for they operate only when a signal is at "danger."

In true A.T.C. a message is transmitted to the locomotive cab, accompanied by action on the brakes if appropriate, whether the signal is at "clear" or conveying a warning to stop. It must also be understood that automatic train control has nothing to do with remote control of "driverless" trains, although one experiment in this direction in the United States took place on a line equipped with A.T.C., so that, if necessary, this equipment would have over-ridden the control signals and have brought the train to a standstill.

Electrical effects of one kind or another have been used in most A.T.C. systems. Experiments employing induction were made early in the century, but so-called "contact" systems, in which current is picked up from a ramp by a shoe or brush under the locomotive, found wider application at this period and even earlier. In a scheme which began on the Northern Railway of France some 80 years ago, the ramp was energised when the signal was at danger, and the current picked up de-energised an electromagnet on the locomotive, thus releasing an armature and sounding a warning whistle. At first a brake application was initiated simultaneously, but later forms of the system, now widely installed on the French National Railways, have given warnings only, and by applying either a positive or negative potential to the ramp, distinctive signals can be given in the cab for "danger" or "clear."

Magnetic receiver on locomotive passing over a Hudd type track inductor



The A.T.C. system most widely installed in this country at present, that on the Western Region of British Railways, is also a contact system. It differs from the French equipment in one principle considered of fundamental importance by British railway signal engineers, namely, that receipt of a warning in the locomotive does not depend on collecting current from the ramp, so that a failure of the supply or of the collecting gear results in a "caution" signal. This form of A.T.C. was developed by the former Great Western Railway and is installed on 1,356 route-miles of the present Western Region.

Western Region Installation

The Western Region A.T.C. is associated with "distant" signals at the lineside, that is to say, signals which when "on" (arm horizontal) warn the driver to be prepared to stop at the next signal. Depending for its action on physical contact between a ramp between the rails and a shoe under the locomotive, the sequence of operations is as follows:—

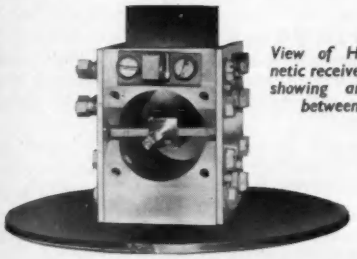
(*a*) Signal "on": a magnetically-operated valve, normally held closed by current from a 4 V battery on the locomotive, is de-energised by the lifting of the shoe as it rides over the ramp, thus allowing air to enter the vacuum brake pipe and in so doing to sound a warning siren.

(*b*) Signal "off": a voltage applied to the ramp (approximately 16 V) causes current to flow via the shoe to a second winding on the electromagnet controlling the brake valve, so holding the valve closed in spite of the interruption of the circuit from the locomotive battery by the lifting of the shoe. A relay in the circuit from the shoe to the electromagnet is also energised and, via a second relay of the slow-release type, connects the locomotive battery to a bell in the cab. Thus the bell forms a distinctive audible signal of clear conditions ahead. After the shoe has left the ramp, the slow-release relay continues to maintain the connection from the locomotive battery to the bell for a second or two—otherwise the bell signal would be too brief to be of value when traversing the ramp at high speeds.

The main relay mentioned above is polarised in order that the system may be applicable to single-line working. In this case the ramps associated with signals for the direction in which the train is running are energised with the normal polarity. Ramps for the other direction are energised automatically with the opposite polarity when the train is signalled. In passing over them, therefore, current is picked up and release of the armature controlling the brake valve is prevented, but the polarised relay does not operate and sound the bell. If these ramps were not energised, which would be the normal condition seeing that their signals are "on," the siren would sound and a brake application would begin every time a locomotive passed a signal applying to the opposite direction of running.

Ramp contact systems have endured best in countries with a relatively mild climate. Snow and ice interfere with the collection of current from the ramp, so that in France, where the caution signal depends on picking up

* The General Electric Co., Ltd.



View of Hudd type magnetic receiver for locomotives showing armature pivoted between pole pieces

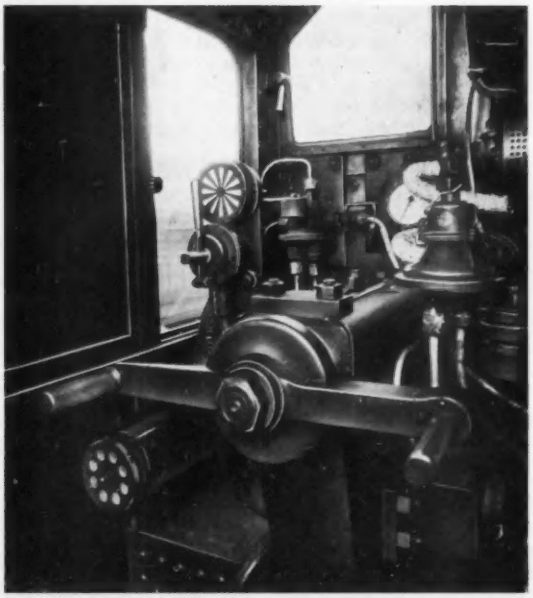
current, various methods have been used for spreading oil on the ramp surface in order to keep it clear of frost. In the Western Region system, as seen already, failure to collect current results in the " caution " warning, which may at times be inconvenient but is not prejudicial to safety. None the less, the development of systems which do not depend on contact with a ramp has been pursued actively. It is an important requirement when the needs of British Railways are considered as a whole. The long service and reliability of the Western Region system are fully recognised, but the liability to interference by severe weather in north-east England and Scotland, for example, are clearly greater than in the area of the " Great Western triangle " with its apex in London and its base extending roughly from Penzance to Birkenhead. When British Railways were formed, an alternative to the ramp and shoe was already in operation. This was the Hudd magnetic system of A.T.C.

A beginning had been made before the second world war with installing Hudd apparatus on the Edinburgh-Glasgow main line of the L.N.E.R., following a strong recommendation for the provision of A.T.C. which was contained in the Ministry of Transport report on the Castlecary accident of 10th December, 1937. This work was not completed, but extensive trials of the same system had been made on the London, Tilbury and Southend section of the L.M.S.R., which brought the equipment into full operational use between Bow Junction and Shoeburyness on 1st December, 1947.

Development of the Hudd System

The magnetic link between track and train characteristic of the Hudd system is the basis of the standard form of A.T.C. which has been under development by British Railways for some years. On the Bow Junction-Shoeburyness line equipment installed on the track at the approach to every distant signal consists of a powerful permanent magnet inductor, and an electromagnet about 15 yd farther on. The permanent magnet deflects the armature of a magnetic receiver carried under the locomotive, thereby preparing to admit air to the vacuum brake system and sounding a siren. This action takes place at the approach to every distant signal equipped for A.T.C., whether it is " on " or " off." The brake application is controlled by a timing reservoir and does not take effect immediately. If the signal is " off," the electromagnet 15 yd farther on is energised from a local battery and returns the locomotive receiver to normal, so that the siren is silenced and the brake valve closed. A short siren blast, therefore, is the " all clear " signal.

On the other hand, if the signal is " on," the electromagnet remains unenergised. The siren continues to sound and the brake application will begin automatically unless the driver intervenes and controls the braking himself after cancelling the automatic action. This is the normal procedure with both the Western Region and the Hudd systems, which are primarily warning systems



Cab indicator and cancelling handle of Hudd type A.T.C. equipment

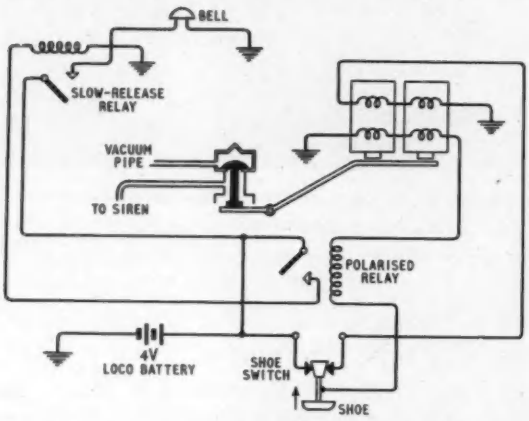
and exercise automatic control only in emergency. In the present Hudd apparatus the locomotive receiver armature acts directly on the brake valve and no local electrical supply in the locomotive is required. In the modified British Railways form of the system, however, the armature operates electrical contacts, and this has enabled the " all clear " signal to be given by a bell as in the Western Region A.T.C. instead of by a short siren blast. The siren is retained for " caution," so that the two audible signals have the distinctive forms characteristic of the Western Region scheme. Special motor-alternator sets are being built to provide a supply for operating A.T.C. relays in locomotives and motor coaches to run on the 50 c/s a.c. system. The alternators will generate at high frequency and their output will be transformed and rectified for relay operation.

Various other modifications of the basic Hudd indications are being made in the British Railways' version, notably to make the system suitable for colour-light areas where signals have three or four aspects instead of the two aspects characteristic of semaphore signalling. The Hudd cab indicator, which reminds a driver when he has received and cancelled a warning signal, is being retained in a slightly altered form.

The magnetic link between track and train in automatic train control is by no means new, a system of this type having been devised and tested on two British railways as early as the 1890s. Until quite recent years, however, there was difficulty in providing permanent magnets of sufficient strength which would also retain their magnetism under conditions of vibration and shock inevitable in a permanent way installation. The introduction, shortly before the second world war, of new magnetic materials of nickel-aluminium-steel completely altered the situation by making possible a magnet of much larger flux output together with permanent characteristics. In the present magnetic installations on the Fenchurch Street-Southend-Shoeburyness line it has been found that permanent magnets have undergone no deterioration in 16 years or more. The normal air gap from magnet to locomotive receiver collector plate is 4 to 5in, but tests have shown

satisfactory operation with gaps up to 8in and more, depending on the speed of the train. The standard test of the apparatus before a locomotive leaves the running shed is to pass over a magnet with weak effective field strength installed below rail level so as to give an overall gap of some 8in, and to check operation in these conditions.

The usual alternatives to-day to a magnetic system are devices depending on electrical induction. A d.c. inductive device used widely in the United States is more in the nature of a non-contact train stop than A.T.C., since it repeats only one signal aspect, but it meets the ultimate requirement of this form of control in being a safeguard against over-running signals. The locomotive equipment consists of a U-core carrying two windings energised in parallel from a battery, one winding being in series with a relay, which is consequently normally energised. The track inductor, positioned so as to leave a gap of about 2in



Schematic diagram showing locomotive equipment of Western Region A.T.C. system

between its poles and those of the locomotive apparatus, carries a winding connected to a control relay, the contacts of which are open when the lineside signal is "on." In these circumstances there is a large increase in lines of force when the magnetic circuit of the locomotive inductor is completed momentarily by its passage over the track inductor, and a pulse of current is induced in the locomotive circuit which opposes the battery and releases the locomotive relay, this action being arranged to initiate the desired control and cab signalling effects. If the signal is "off," on the other hand, the track inductor coil forms a closed circuit through the contacts of its control relay, so that it retards the increase in lines of force when the locomotive inductor passes over it and the reaction in the locomotive circuit is too small to release the locomotive relay.

A d.c. inductive system of Swiss origin makes use of transmitting and receiving inductors on the locomotive, the former being continuously energised from the locomotive battery. Two interconnected track inductors are associated with a lineside signal, and when the locomotive transmitting inductor passes over one of them, a pulse of current circulates in the closed circuit formed by the two track inductors and so induces a corresponding pulse in the locomotive receiving inductor, causing the operation of a relay in the A.T.C. equipment. When the signal is at "clear" the track inductors are short circuited and therefore do not act as a link between the transmitting and receiving sides of the locomotive equipment. By using additional track and locomotive inductors and interconnecting them in various ways it is possible to give three different cab indications, corresponding to "clear" and two degrees of "caution" warning, while the addition of a permanent magnet enables a "stop" signal to be given as well.

Induction at audio frequencies has been used in Germany, with a three-frequency generator feeding the locomotive inductor. The track equipment consists of tuned circuits which momentarily absorb some of the energy from the locomotive circuit at their own frequency and cause the release of a relay in the locomotive equipment. Each relay initiates a different cab signal and control effect.

Continuous Indication

All the above systems are "intermittent," that is to say they give indications only when a locomotive is passing the equipment locations. Ideally, a driver would be informed continuously of any changes in the condition of the line ahead, and this requirement is met by an inductive link in conjunction with coded track circuits. In this arrangement alternating currents circulating in the rails are interrupted at different frequencies according to the condition of the signalling section ahead. They induce corresponding currents in inductor coils on the locomotive, which are amplified, decoded, and used both to illuminate the appropriate aspect of a miniature colour-light signal in the cab and to effect control of braking if desired.

Thus, if a driver has entered a section under "caution" conditions, the "caution" signal will be continuously before his eyes in the cab until he reaches the lineside signal showing red, when his cab signal indication will change correspondingly. If, on the other hand, the signal which has been at "danger" changes to "caution" or "clear" before the train reaches it, this fact will be signalled to the driver at once and so save the delay involved in running at low speed until the lineside signal comes into view. Continuous systems of this type are in operation in the United States. They are the most expensive form of A.T.C. to provide, and although a system has been demonstrated in this country, their adoption is not contemplated at the moment.

Limitations of Radar

Any suggestion of automatic control for trains inevitably raises the query whether radar devices could be employed. It would seem that the only practicable application of such methods would be to install pulse transmitters on locomotives and responders on the rear vehicles of trains. Any attempt to use direct echoes would be ruled out by the multitude of lineside objects from which echoes would be obtained. Presumably, the strongest advocates of radar control for railways do not suggest that a driver should interpret a complex c.r.t. display himself. The alternative of apparatus to sift the mass of echoes and convert the relevant responses into clear and unambiguous cab signals appears still to be impracticable. Experiments reported from Russia with electronic computing apparatus to control signalling and set up the most suitable routes for the flow of traffic in congested areas still leave open the question of how compliance with signals is to be ensured. The very small number of serious accidents caused by signals being unseen or disregarded has, up to now, reduced the priority accorded to automatic train control. Now that this subject has become one of public concern, a policy of combining the best features of systems which have proved themselves is better calculated to bring the results desired than one of pursuing new methods for their own sake.

VIEWS on the NEWS

By REFLECTOR

IT is interesting to note the various claims made in the nuclear power field. The Russians started it when they announced about three years ago that they had a 5 MW station running and supplying power to the neighbouring district; they claimed it to be the first public supply nuclear power station, although others regarded it as experimental. Then Calder Hall was connected to the grid and as it supplied up to 92 MW it was said to be the first "full-scale" public supply station. This was true, but still the primary purpose of Calder Hall was to produce plutonium. The first truly public supply nuclear power station in this country will be Berkeley (Glos.) or Bradwell (Essex) either or both of which are expected to be commissioned by 1961; each will have a rating of 300 MW or more. In the meantime, the Shippingport (Pennsylvania) reactor with an electrical rating of 60 MW has been started up and this is claimed to be "the world's first full-scale central atomic plant devoted exclusively to civilian purposes." No doubt other nations will soon be priding themselves on being the first in the field for something or other in the way of nuclear power stations.

* * *

Apparently the gas industry suffers from the "amateur" as the electrical industry does. The chairman of the East Midlands Gas Consultative Council (Mr. A. H. Wood) attributed this to the Gas Board's high scale of charges for fixing appliances. I suppose there is even more danger in this than in the case of electrical appliances although badly-installed gas apparatus should give olfactory warning. Another point raised by Mr. Wood was that many people living alone did not use enough gas to obtain the cheaper tariff. This, of course, applies to electricity—even more so where there is a standing charge.

* * *

Steam locomotives are eventually to disappear from the British railways although the process will take some time. In Holland the last of the steam locos has made its last trip and is now in an open-air railway museum at Utrecht. For some time the passenger services of the Netherlands Railways have been operated solely by electric or diesel equipment. Now that freight traffic is also handled in this way Holland becomes the first European country to abandon steam traction. I can sympathise with those who lament the passing of the "iron steed," although it is not so dashing and romantic as the stage coach was. But I still believe that travel will be better and cleaner for its disappearance.

* * *

Before Parliament rose for the Christmas recess Mr. Butler told the House of Commons that it was hoped to publish full scientific details of the results obtained from the "Zeta" equipment at Harwell. The work being carried out with this equipment relates to nuclear fusion. Later, while in the United States, Sir David Eccles made a similar statement. Now it has been announced that the disclosure will be made next week. The delay has apparently been due to the necessity for consultation with the United States Atomic Energy Commission before any information of this kind is "declassified." Fears have been expressed that in some way this system will detract from the credit due to British scientists for the remarkable work they have carried out. I do not think that this will be so. But in the past later developments based on fundamental research in Great Britain have often been hailed as the exclusive work of foreign scientists. I suppose we may blame this largely on our failure to follow up discoveries for financial or other reasons.

* * *

From Chicago *Reuter* reports the appearance at an exhibition of what it calls a "walkie-cookie electric oven" by which a woman can cook a meal by remote control while miles away from home. This Westinghouse device is said to regulate the temperature of the cooker by means of a miniature radio transmitter and "each oven has a different wavelength to prevent confusion." I can see the need for this; it would be possible otherwise for one woman to spoil another's meal by interference. But isn't it possible that the waveband used will become a little congested if the system becomes too popular?

* * *

Radio-telegraphy, like most other broad inventions, had a number of begetters. Everybody recognises the names of such people as Hertz, Lodge and Marconi, and maybe the Russian Popoff, but their contributions to the art were apparently anticipated by a Professor Loomis, "the distinguished American astronomer" who, it was reported in the *Electrical Review* of 15th January, 1878,

> "has recently succeeded in telegraphing by means of aërial electric currents without the use of a wire to complete the circuit. The experiments were made between two lofty peaks, ten miles apart, in the mountains of West Virginia. He flew two kites, one on each peak, by means of copper wire instead of the ordinary pack-thread, and signals were transmitted between the kites by making and breaking the earth connection. Continuous aërial currents were observed, except when the weather was violently broken. It is said that a scheme is mooted by Prof. Loomis for testing this method of telegraphing between the Alps and the Rocky Mountains! We dare not speculate on the results of such a feat should it be possible to achieve it."

Loomis's experiments are referred to in G. G. Blake's "History of Radio Telegraphy and Telephony" (Radio Press, Ltd., 1926) but here he is described as "an American dentist." It is said that Loomis took out a patent for "establishing an electrical current for telegraphic or other purposes without the aid of wires, batteries or cables."

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Unshaded Street Lamps

THE recent correspondence in your journal concerning the above indicates that there is some misconception concerning the use of unshaded lamps. In fairness to street lighting engineers and lighting authorities it should be pointed out that the " background brightness " technique of street lighting demands that the lantern beam should be directed towards the oncoming motorist at an angle of about 10 deg below horizontal. This is achieved by the use, in modern lanterns, of refractors which take the place of reflectors as used in interior lighting.

The alternative method is to apply a degree of light cut-off, but it must be remembered that this cut-off reduces the length of road which can be catered for by each lantern and consequently calls for the closer spacing of lighting columns with the additional expense involved. There are pros and cons for either method but it is desirable that the use of unshaded lamps should not be ascribed either to carelessness or perverseness.

Mr. C. R. Cadman has thrown down the gauntlet on the side of the sodium lamp. I disagree entirely with his statement that the only light of any real value is the sodium lamp; indeed I can only assume that he would not have made so sweeping a statement without having his tongue firmly in his cheek. I am not disparaging the sodium lamp when I express the view that it is only one of many excellent light sources, each of which has a valuable part to play, and none of which has any claim to absolute supremacy in street lighting.

London, W.C.2. W. ROBINSON,
Lighting Officer,
British Electrical Development Association.

Slot Meters in Hotel Bedrooms

I WONDER whether I may, although somewhat belatedly, and in my capacity as an itinerant user of electricity, support " Reflector's " condemnation in the *Electrical Review* for 20th December, of the positioning of meters in many hotel bedrooms.

I am not so concerned about finding out what my predecessor has left me, but possibly would be more concerned about how much I am leaving my successor !

My main complaint, however, is the supreme difficulty in many cases of finding out just which coin is required, a difficulty which is accentuated by my wearing of bi-focal glasses. I take off my hat to the few hotel managements who are thoughtful enough to put in a prominent position a bold and clear notice stating the coin, or coins, which may be used, and I almost go down on my hands and knees in gratitude to those who add the value that one gets for the money put in.

Englefield Green, Surrey. C. A. CAMERON BROWN.

Control Apparatus Manufacturers' Luncheon

THE number of small, inefficient, hard-run plants would become gradually fewer; and as firms became larger and amalgamations occurred, the drive for industrial instruments and their better use would go forward, said Mr. S. P. Chambers, C.B., C.I.E., senior deputy chairman of Imperial Chemical Industries, Ltd., at the annual luncheon of the British Industrial Measuring and Control Apparatus Manufacturers' Association (BIMCAM), held in London on 7th January.

Mr. E. W. Wilson, chairman of the Association, referred to its export record for 1957, in which it was expected that exports would exceed £15 million out of a total turnover of £35 million. He stressed that home trade was the basis of export sales and expressed the hope that this basis would expand with the anticipated increase of the export market when the European Free Trade Area came into being. Mr. Wilson announced that the Instruments, Electronics and Automation Exhibition in April would be 50 per cent larger than the previous exhibition and would for the first time be international. He also announced that the headquarters of BIMCAM would be moving to a new address early in the year.

Mr. L. S. Yoxall, president of BIMCAM, proposed the toast of the guests and Mr. T. E. Goldup, President of the Institution of Electrical Engineers, in reply, referred to measurement and control as the most important factor in industry to-day. The country could not progress unless the continual changes occurring in industry could be measured and then controlled. There was also the need for men who could read the instruments intelligently. There was an appalling shortage of technical manpower at all levels, and this was the greatest limitation on industrial progress. The Hives Award would not achieve its objectives unless industry spent time and money on training to match the Award course.

At the annual luncheon of BIMCAM. Left to right : Mr. J. B. L. Munro (Engineering Division, Board of Trade); Mr. L. S. Yoxall (president, BIMCAM); Mr. S. P. Chambers (senior deputy chairman, Imperial Chemical Industries, Ltd.); and Mr. E. W. Wilson (chairman, BIMCAM)

University Education in Marine Engineering

IN a paper read before the North East Coast Institution of Engineers and Shipbuilders on 10th January, Professor G. H. Chambers said that when British marine engineering was being built up the industry could choose and train its men more freely than it could now when two important factors applied. First, the industrious young man would almost certainly be able to go to a university and a firm that was not prepared to increase its recruitment of graduates would therefore be at a disadvantage. Secondly, the branches of applied science which related to the propulsion of ships had recently expanded rapidly. There was a wider choice of prime mover, the importance of materials had increased, electricity had broader applications and nuclear energy was a potential source of power. Hence there was a need for wider knowledge than used to be associated with a marine engineering firm. In fact the marine engineer now needed to be familiar with electrical engineering and some aspects of chemical engineering as well as to have a good knowledge of metallurgy, corrosion and naval architecture.

There was, however, a limit to what the student could be expected to digest and his training must be kept to fundamentals, which should be presented in such a way that their relationship to marine engineering was emphasised. This vocational approach was in no way inconsistent with university work and what the course should do was to coat the pill of fundamentals with a marine engineering flavour.

TRAINING IN FUNDAMENTALS

At King's College, University of Durham, the curriculum for applied science related to marine engineering was very similar, except in its later stages, to that followed by mechanical engineers. The full course leading to a degree lasted four years. A feature of the second, third and fourth year studies was the importance attached to electrical engineering, while the work during the fourth year had a clear relationship to marine engineering and also included the fundamentals of nuclear engineering.

Work at the university had, however, to be dovetailed with the more practical forms of training which were an essential part of the development of the professional marine engineer. If he wished to design installations or to practise marine engineering in its more administrative forms he would need to have experience at sea. This dovetailing of the university, industry and sea was most satisfactorily achieved through co-operative action by the engine builder and the shipping lines. One way of doing this was for the shipping line to recruit students during their earlier years at the university and then to arrange with an engine builder for part of the long vacations to be spent in the works or on a short voyage.

Brussels Exhibition

IN addition to those trade associations and manufacturers who are supporting the Electrical and Allied Industry Section in the British Industries Pavilion at the Brussels Universal and International Exhibition, and whose names we listed last week, the following firms and organisations with electrical interests are exhibiting individually, are supporting the group exhibit of the Birmingham Exchange and Engineering Centre, or have had equipment selected for display by the Council of Industrial Design.

Individual Exhibitors

Acrow Engineers (Export), Ltd.; the Atomic Energy Authority; Atomic Power Projects of: The English Electric Co., Ltd.,* Babcock & Wilcox, Ltd.,* and Taylor Woodrow, Ltd.; Babcock & Wilcox, Ltd.*; the British Broadcasting Corporation; the British Vacuum Cleaner & Engineering Co., Ltd.; Clarke, Chapman & Co., Ltd.; Hoover, Ltd.*; Imperial Chemical Industries, Ltd.; the Nuclear Power Plant Co., Ltd.; the Revo Electric Co., Ltd.; and Standard Telephones & Cables, Ltd.*

Birmingham Engineering Centre

Keith Blackman, Ltd.; Broom & Wade, Ltd.; Chance Bros., Ltd.; Dallow Lambert & Co., Ltd.; the E.M.B. Co., Ltd.; E.M.S. Electrical Products, Ltd.; Griffiths Bros. & Co. London, Ltd.; the Harland Engineering Co., Ltd.*; the Harris Engineering Co., Ltd.; the Horstmann Gear Co., Ltd.; Kango Electric Hammers, Ltd.; Keelavite Rotary Pumps & Motors, Ltd.; Lacy-Hulbert & Co., Ltd.; the Lamson Engineering Co., Ltd.; the Lightfoot Refrigeration Co., Ltd.; Meritus (Barnet), Ltd.; the Midland Electric Manufacturing Co., Ltd.; B. O. Morris, Ltd.; the Morgan Crucible Co., Ltd.; James Neill & Co. (Sheffield), Ltd.; Newman, Hender & Co., Ltd.; Rapid Magnetic Machines, Ltd.; Sangamo Weston, Ltd.*; Joseph Sankey & Sons, Ltd.; Thomas Savery Pumps, Ltd.; the Simplex Electric Co., Ltd.*; Sumo Pumps, Ltd.; the Thermal Syndicate, Ltd.; and Wright Electric Motors (HX), Ltd.

Council of Industrial Design

Acme Wringers, Ltd.; E. K. Cole, Ltd.*; Hoover, Ltd.*; Hurseal, Ltd.; the Jackson Electric Stove Co., Ltd.*; Morphy-Richards, Ltd.; Parnall (Yate), Ltd.; the Simplex Electric Co., Ltd.*; Simplus Products, Ltd.; Sunbeam Electric, Ltd.; Vent Axia, Ltd.; S. N. Bridges & Co., Ltd.; Bulpitt & Sons, Ltd.*; Corfield-Sigg, Ltd.*; L. G. Hawkins & Co., Ltd.; Herbert Terry & Sons, Ltd.; Falk, Stadelmann & Co., Ltd.*; Bush Radio, Ltd.; A. C. Cossor, Ltd.*; Electric Audio Reproducers, Ltd.; Philco (Overseas), Ltd.; Portogram Radio Electrical Industries; and Trix Electrical, Ltd.*

Those firms marked with an asterisk are also supporting the Electrical and Allied Industries Section.

Symposium on Semi-Conductors

THE Metal Physics Committee of the Institute of Metals is organising a one-day symposium on "Metallurgical Aspects of Semi-Conductors," to be held on 25th February at the College of Technology, Gosta Green, Birmingham. In conjunction with the meeting, an exhibition is being arranged at the College by the Royal Radar Establishment, Great Malvern. This will also be open on the evening of 24th February.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

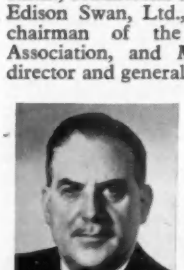
The Minister of Power has appointed **Mr. J. H. Warren,** O.B.E., M.A., D.P.A., of St. John's Wood, London, as a part-time member of the London Electricity Board.

Mr. F. Rostron, M.B.E., M.I.E.E., M.I.Ex., has been appointed a director of Ferranti, Ltd. Mr. Rostron joined the company in 1917 and has been export sales manager since 1934, a position he still holds. He has been closely associated with the company's export business in the North American market and in 1954 was awarded the M.B.E. in recognition of his many services to the British export drive. He is president of the Manchester Chamber of Commerce and was previously vice-president of the Chamber and chairman of its Engineering and Metals Executive Committee.

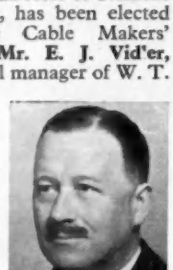
Mr. F. Rostron

In the last war Mr. Rostron served as an electrical engineering officer in the R.A.F. from 1941 to 1945 and was twice mentioned in dispatches.

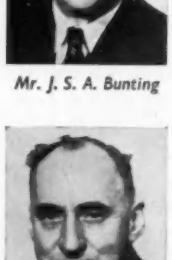
Mr. J. S. A. Bunting, M.C., Associate I.E.E., commercial director of Siemens Edison Swan, Ltd., has been elected chairman of the Cable Makers' Association, and **Mr. E. J. Vid'er,** director and general manager of W. T. Henley's Telegraph Works Co., Ltd., has been elected vice-chairman. **Mr. H. B. Davies** has been re-elected chairman of the Mains Cable Manufacturers' Association and the Mains Cable Manufacturers' Association (Super-Tension), and **Mr. R. B. Hill,** of W. T. Henley's Telegraph Works Co., Ltd., has been elected chairman of the Rubber and Thermoplastic Cable Manufacturers' Association.



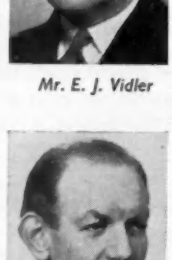
Mr. J. S. A. Bunting



Mr. E. J. Vidler



Mr. H. B. Davies



Mr. R. B. Hill

In referring to the new appointments to the Central Electricity Generating Board in our last issue, we stated that **Mr. W. H. Dunkley,** B.Sc., M.I.Mech.E., M.I.E.E. (who becomes controller of the South Eastern Division), was previously chief generation engineer (operation) of the Yorkshire Division of the C.E.A. This should have read chief generation engineer (construction).

Mr. C. W. M. Phillips, A.M.I.E.E., F.I.E.S., has resigned his position as manager, lighting sales, A.E.I. Lamp & Lighting Co., Ltd., to join the Britannia Engineering Co., of Luton, as managing director.

Mr. C. W. M. Phillips

Mr. Phillips was educated at Lawrence Sherrif School, Rugby, and at Rugby College of Technology and Arts. He served an engineering apprenticeship with the B.T.H. Co., Rugby, from 1927 to 1933, and subsequently held successive appointments with that company, becoming manager of lighting sales of the A.E.I. Lamp & Lighting Co. in 1955.

Mr. P. C. Grainger-Phillips has been appointed service manager of the Tricity Service Department of Tricity Cookers, Ltd. Mr. Grainger-Phillips served as a captain in the R.E.M.E. during the war and in 1948 emigrated to South Africa where he directed his own general engineering business in Durban. Returning to the United Kingdom in 1950 he joined the English Electric Co., subsequently becoming area representative to the No. 2 Sub-Area, Southern Electricity Board.

The Midlands Electricity Board has appointed **Miss K. Martin** as senior demonstrator in the Central Gloucestershire Sub-Area. Miss Martin will operate from the Sub-Area headquarters. She was previously in the Luton District of the Eastern Electricity Board and has also held similar positions at Exeter and Teignmouth.

The Metropolitan-Vickers Electrical Co., Ltd., announces the appointment of **Mr. A. O. Ahlquist,** M.A., A.M.I.Mech.E., as sales manager, Mechanical Department. He succeeds **Mr. H. Lawson - Jones,** who will act in an advisory capacity, and has been transferred to sales management.

Mr. A. O. Ahlquist

Mr. Ahlquist, after taking his degree at Cambridge, joined the company in 1941 as a college apprentice. For the six years following his apprenticeship he was concerned with gas turbine activities. After a shorter period in the Steam Turbine Engineering Department, he was transferred in 1949 to the M-V Export Co. in London. He returned to the Trafford Park Works in 1950 as sales engineer in the Mechanical Sales Department. In 1951 Mr. Ahlquist was appointed assistant to the sales manager (large turbines), Mechanical Department, and he became assistant sales manager, Mechanical Department, in January, 1957.

Mr. E. Pearson has been appointed assistant sales manager of Fielden Electronics, Ltd. **Mr. G. Ensor,** general manager of the company, has now resumed the office of sales manager in addition to his other duties.

The British Driver-Harris Co., Ltd., has announced the following promotions:—**Mr. H. E. R. Thomas,** for several years assistant sales manager, becomes sales manager; **Mr. H. Kay,** A.C.A., who has been with the company for ten years, in the accounting and costing departments, becomes chief accountant; **Mr. H. J. Andrew,** who has twenty years' service, has been appointed assistant secretary; **Mr. T. Schofield,** A.M.C.T., A.I.M., takes up a new appointment as technical assistant to the managing director after thirty years with the company; and **Mr. A. Sargeant,** also with thirty years'

Mr. H. E. R. Thomas

service, is promoted to wire mill manager.

As we have already reported, **Mr. Frederick Bentham,** F.I.E.S., has been appointed a director of Strand Electric Holdings and the other companies within the group to fill the vacancy caused by the retirement of Mr. L. G. Applebee. Mr. Bentham has been with Strand Electric for nearly 26 years, during which time he has concentrated on research and development of lighting equipment. He is an acknowledged authority in the specialist field of stage lighting control and examples of his work are to be found at Drury Lane, the Palladium, and many other famous theatres here and abroad. In the last three years he has been responsible for the centralised remote control of the lighting in all the 18 television studios in Britain so equipped. He is a lecturer on his subject and is the author of " Stage Lighting " (Pitman).

Mr. E. G. Lennard, M.I.Ex., who joined Peña Industries, Ltd. (then the Peña Copper Mines), as export sales manager in October last, has now been appointed managing director of the Penco Export Co., Ltd., a new subsidiary of the Peña group. This company will undertake Peña's exports, particularly in electronics, plastics and special steels.

Mr. E. G. Lennard

Since the war Mr. Lennard's positions in the electronics exports field have included those of senior export executive at E.M.I. and general export manager of Birmingham Sound Reproducers, Ltd.

Dr. E. R. Laithwaite, author of the article " Brushless Variable-Speed Motor " (page 97), was born at Atherton, Lancashire, and educated at Kirkham Grammar School and Manchester University, serving during the war in the Technical Branch of the Royal Air Force. In 1949 he graduated from Manchester with 1st class honours. Dr. Laithwaite then obtained degrees of M.Sc. and Ph.D., and has lectured on the staff of the Electrical Engineering Department, Manchester University, since 1950.

Dr. E. R. Laithwaite

The E.I.B.A. had this year found itself in some difficulty, more people were claiming benefits and the value of money had fallen, and something

Principal guests at the annual dinner-dance of the Nottingham Branch of the E.I.B.A. Left to right: Mr. N. F. Marsh (deputy chairman, East Midlands Electricity Board), Mrs. Marsh, Mrs. and Mr. I. A. A. Macdonald (chairman), Mrs. and Mr. J. S. Pickles (national president) and Mrs. and Mr. C. R. King (past president)

in excess of £16,000 would have to be raised next year as additional income, said Mr. I. A. A. Macdonald, chairman of the Nottingham Branch of the **Electrical Industries Benevolent Association,** at its annual dinner-dance, held at the Victoria Station Hotel, Nottingham, on 3rd January. Mr. Macdonald, who was proposing the toast to the E.I.B.A., said the branch income depended largely on the prize draw and socials. More members were wanted, and a drive to that end was now beginning to bear fruit.

In reply, Mr. J. S. Pickles (national president) said they were trying to increase their funds by £15,000, and there were good grounds for thinking they would not be very far away from that target. He paid tribute to the work carried out for the Association by Mr. C. R. King (past president).

Mr. G. H. Rowbottom, for the past ten years chief electrical engineer of the Scottish Division of the National Coal Board, has retired. He was educated at Dundee High School and entered St. Andrews University in 1909, graduating as B.Sc.(Eng.) in 1912. He received his early training with Alley & MacLellan, and later joined Crompton & Co., Chelmsford. In 1919 he returned to Scotland and in 1921 was appointed sales manager to the Clyde Valley Electrical Power Co. and its associated company, the Strathclyde Electricity Supply Co. In 1927 he was promoted executive engineer to the group, which then included the Lanarkshire Hydro-Electric Power Co.

On the formation of the National Coal Board in 1947 Mr. Rowbottom became divisional chief electrical engineer to the Scottish Board.

Mr. A. R. Mathias has been appointed chairman of the Lead Development Association for the current year in succession to **Mr. H. L. Evans,** who has held this office since January, 1956. **Lt.-Col. W. E. Grey** has been reappointed chairman of the Lead Sheet and Pipe Section of the Association.

Mr. H. J. Yardley, chief cashier of the General Electric Co., Ltd., at its head office at Magnet House, Kingsway, W.C.2, has retired after forty-eight years' service with the company, broken only by service in the 1914-18 war. Mr. Yardley joined the G.E.C. as an office junior in 1909, and was attached to the Accounts Department until 1924. Following that he became assistant cashier for ten years, when he joined the Purchase Accounts Department. He was appointed chief cashier in 1946.

Mr. H. J. Yardley

Mr. O. C. Waygood, O.B.E., M.I.E.E., is retiring as consulting engineer to Lewis's, Ltd., on 1st February next. He will be carrying on in a private capacity from his home address for the time being.

Mr. G. Wright, A.M.I.E.E., A.M.I.Mech.E., has recently rejoined the British Electric Resistance Co., Ltd., and the British Power Transformer Co., Ltd., as their chief engineer. He has been invited back to the British Electric Resistance Co. some fourteen years after he was transferred during the war under Government direction to Kelvin & Hughes, Ltd.

Mr. G. Wright

Dr. R. S. Silver, M.I.Mech.E., F.Inst.P., has been appointed general manager of the technical division of

G. & J. Weir, Ltd. Dr. Silver was head of the company's Research Department from 1939 to 1946 and before returning to the company in 1956 he gained considerable experience in the fields of steam and combustion engineering, where he held responsible appointments in design and development.

Mr. David C. Hagen, head of the technical division of G. & J. Weir, Ltd., has retired, on medical advice, after forty-seven years' service.

In our "Industrial News" section we report the inauguration of the Electric Cable Makers' Federation, embracing about forty firms. It is mentioned that the first president is **Mr. F. Waine,** J.P., a director of British Insulated Callender's Cables, Ltd. His portrait is reproduced with this note. Mr. Waine was chairman of the Cable Makers' Association in 1953-54.

Mr. F. Waine

Mr. L. H. Gadd, F.C.I.S., A.C.W.A., has been appointed financial accountant to Metal Industries, Ltd. He was formerly chief internal auditor of the Parkinson Cowan group.

Mr. T. Worsnop, manager of the Engineering Department of Ransomes & Rapier, Ltd., has retired after forty-three years' service with the company.

Mr. V. E. Connor, B.Sc.(Eng.), A.M.I.E.E., has been appointed chief engineer of Astral Switchgear, Ltd. He has been with the company since 1947, latterly as chief inspector. Before that he was with the Westrex Co., Ltd.

Mr. B. Hargreaves

Mr. B. Hargreaves has been appointed chief engineer of Ashley Accessories, Ltd., parent company of the Ashley group, and will be concerned *inter alia* with product development, design and quality. Mr. Hargreaves held a similar position with Astral Switchgear, Ltd., an associated company of the group.

Ultra Electric, Ltd., has completed the reorganisation of its Special Products Division at Western Avenue, Acton, London, W.3, under Mr. A. V. Edwards, a director of the company and general manager of the division. The division comprises three departments—Commercial including Sales, headed by **Mr. A. M. Pollock,** commercial manager; Engineering, headed by **Mr. W. H. Medcalf,** A.M.I.E.E., A.M.I.Mech.E., chief engineer; and Production, headed by **Mr. R. M. W. Grant,** M.I.E.E., M.I.Mech.E., factory manager and chief executive in charge of all production activities. Mr. Grant was previously factory manager of the transformer division of the General Electric Co., Ltd., Witton.

Mr. A. St. G. Prynne, M.A., A.M.I.E.E., has been appointed commercial manager of Racal Engineering, Ltd., and **Mr. I. H. M. Campbell** has been appointed chief of sales with responsibility for home and export sales, publicity and advertising.

Mr. K. Druce, D.F.H., A.M.I.E.E., has been appointed manager of the Bristol office of the English Electric Co., Ltd., responsible for the South West of England territory, in succession to **Mr. T. Robinson,** who retired on 31st December.

Mr. Druce was educated at Forest, Essex, and Faraday House, London. He obtained practical training at Davey, Paxman & Co., Ltd., of Colchester. From 1940 to 1946 he served in the R.N.V.R. as an electrical officer, with appointments at home and overseas. From 1946 to 1948 he was in the English Electric Switchgear Department at Stafford, and during the past eight years has been in the London office, having close associations with the Admiralty, with whom he will continue to do liaison work on behalf of the company. Mr. Druce is a member of Council of the Faraday House Old Students' Association and also the Batti-Wallahs' Society.

Following the retirement of **Mr. I. Mackintosh,** also on 31st December, **Mr. H. Granville-Brown,** A.I.E.E., has taken charge of the company's Southampton office, which has moved to new premises at 29, Shirley Road, Southampton (telephone: Southampton 28333/3).

Mr. Granville-Brown was educated at Belmont College, London, Battersea Polytechnic and Birmingham Technical College. He joined Edmundsons Electricity Corporation, Ltd., in 1926, with whom he received his early training. During the war he served with the R.A.F. as an electrical engineer officer. He returned to Edmundsons after the war and later was with Ewbank & Partners, consulting engineers, before joining the English Electric Co. in 1947.

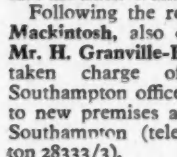
Mr. J. Driscoll has been appointed sales manager of the diesel engine division of the English Electric Co., Ltd., at Brownsover Hall, Rugby, after nine years' service with the company. Mr. Driscoll is a Londoner and served with the Royal Tank Corps before he joined the English Electric Co. In his new post he will have responsibility for sales at home and overseas.

Mr. F. V. M. Morgan is appointed contracts manager of the diesel engine division. He joined the English Electric Co. in 1936 as an engineering apprentice at Stafford. In the last war he was commissioned in the Royal Corps of Signals, and returned to the company's Stafford Works in 1946. From 1949 until his present appointment Mr. Morgan has been chief contracts engineer with the diesel engine division at Rugby.

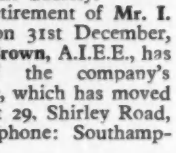
Mr. L. G. Lewzey, M.C., T.D., has been appointed assistant secretary and assistant comptroller of the A.E.I. Lamp & Lighting Co., Ltd. He was educated at Highbury County School and subsequently spent seven years studying electrical engineering and illuminating engineering at Northampton. He is an associate member of the Chartered Institute of Secretaries and a Fellow of the Illuminating Engineering Society. He joined Metrovick Supplies, Ltd., in 1928 and from 1934 to 1939 was responsible for the application design of industrial lighting with the M.V.E. Co., Ltd. During the war he served with the Royal Artillery and returned to Metropolitan-Vickers in 1945 as assistant to the sales manager, Lamps and Lighting Department, subsequently becoming commercial manager, Lamps and Lighting Department, in 1951. Since 1956 he has served with the Secretary's Department of the British Thomson-Houston Co.

Mr. L. G. Lewzey

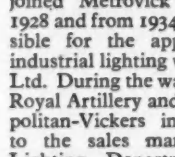
The West London Branch of the **Association of Supervising Electrical Engineers** held its annual dinner and dance on 4th January at the Clarendon Restaurant, Hammersmith, some 150 members enjoying a pleasant evening. Mr. E. A. Bromfield, general secretary, proposed the toast of the ladies, and Mrs. A. E. Petrie responded. The toast of the West London Branch was



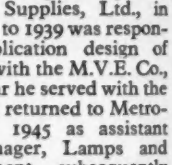
Mr. K. Druce



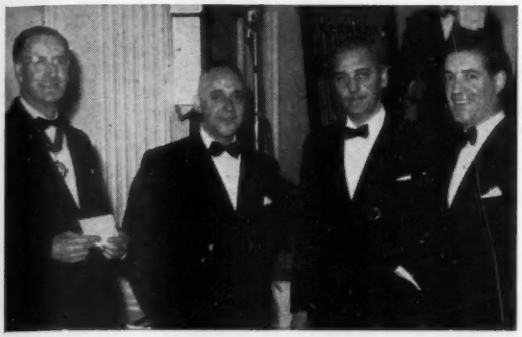
Mr. H. Granville-Brown



Mr. J. Driscoll



Mr. F. V. M. Morgan



At the annual dinner-dance of the A.S.E.E. West London Branch. Left to right: Messrs. G. H. Parker (national chairman), G. A. Noyes (branch chairman), E. A. Bromfield (general secretary) and N. G. O'Hara (branch secretary)

proposed by Mr. G. H. Parker, national chairman, who, in referring to the fine record of the branch, spoke of the large number of branch members who had served, and were now serving, on the Executive Committee.

Mr. M. G. Jones, London engineer and deputy sales manager of the Watford Electric & Manufacturing Co., Ltd., and **Mr. R. A. F. Craven,** chief research and development engineer, have been appointed to the board of the company.

Mr. R. A. Erskine, managing director of Erskine, Heap & Co., Ltd., has been appointed president, for the coming year, of the Manchester and District Engineering Employers' Association.

Mr. R. A. Erskine

Mr. L. A. Sanson has been appointed senior resident representative in Canada for D. Napier & Son, Ltd., in succession to Mr. P. J. Waite, and will be responsible for the company's aviation and diesel engine activities. In addition he will represent the guided weapons and aviation equipment divisions of the English Electric Co., Ltd. Mr. Sanson's address is 6,035, Cote de Liesse Road, Montreal, 9, P.Q., Canada.

F. Westerman (Wholesale), Ltd., held its annual staff dinner on 4th January at the Grand Hotel, Birmingham. In proposing the toast of the staff, Mr. F. Westerman said the company had had a good year. He assured the staff that in joining the Edmundsons group the company would not lose its identity or name. Mr. J. Goodwin, Leicestershire representative, replied for the staff, and Mr. H. J. Gibson, chief commercial officer, Midlands Electricity Board, replied for the guests. Mrs. Westerman presented the Welec Snooker Cup to the winner, Mr. R. Walker, the company's accountant, and three travelling alarm clocks to Miss Alice Ricketts, Mr. Leslie Maddox-Jones and Mr. H. E. Bagnall for long service. Other guests attending were Mr. W. Parker (director, Monmore Conduits, Ltd.), Mr. G. Palfreyman (sales manager, Bill Switchgear, Ltd.), Mr. N. G. Smith (joint sales manager, Edmundsons Electric Co., Ltd.) and Mr. A. H. Young (deputy chairman of Edmundsons).

Mr. J. H. Neill, deputy chairman of James Neill & Co. (Sheffield), Ltd., is leaving on 22nd January on a nine-week "round the world" business trip.

Mr. A. F. Plummer (president) took the chair at last Tuesday's gathering of the **Electrical Industries Club,** and after luncheon, called upon Mr. J. J. Thompson, who spoke of the good work done by Mr. Hugh F. Wickham as former social secretary and made a presentation to him on behalf of the members. The guest-speaker was Mr. Colin Cowdrey, the England and Kent cricketer who, after a much appreciated address, answered questions put to him by members. A vote of thanks to the speaker was proposed by Mr. Colin Campbell, the hon. social secretary. Concluding the proceedings, Mr. Plummer mentioned the forthcoming retirement of Mr. A. B. Wildsmith, who was mainly responsible for the establishment of the Club, and paid a tribute to him; Mr. Wildsmith briefly responded.

Mr. P. Steer, who has been in the Plastics Division of Hellermann, Ltd., for many years, has been appointed manager of that department. In making the announcement, Bowthorpe Holdings, Ltd., the parent company, refers to the acquisition in 1952 of the plastics extrusion business of Cheltenham Plastics, Ltd., as a complement to the business of Hellermann, Ltd., and states that while the output of Cheltenham Plastics has been sold through Hellermann, Ltd., the separate company has continued to exist. At the end of this year, however, the merger between the two companies will be made complete by the liquidation of Cheltenham Plastics and the absorption of its plant, machinery, personnel, etc., with that of Hellermann, Ltd. In future the extrusions and handles previously manufactured by Cheltenham Plastics will, therefore, be made by Hellermann, Ltd., and will be handled by the Plastics Extrusion Division of that company.

Mr. P. Steer

Mr. R. Templeman, who has recently been appointed works manager with Astral Switchgear, Ltd., previously held a similar position with T. B. Morley & Co., Ltd., Doncaster. After apprenticeship with Bolckow Vaughan & Co., Ltd., he was with Dorman Long, and Engineering Components, Ltd., and then chief engineer of Addis, Ltd., Hertford.

Mr. G. Cole, formerly assistant publicity manager of the Thorn Group, has been appointed advertising manager, Atlas Lighting, Ltd., and the Advertisement Department is now at 233, Shaftesbury Avenue, London, W.C.2.

Mr. G. Cole

Mr. J. Oldham, O.B.E., chairman of Oldham & Son, Ltd., left by air on 14th January on a visit to Africa. He expects to be in Africa for about six weeks.

OBITUARY

Mr. H. R. Waddington, a director and former managing director of Gent & Co., Ltd., died at his home in Leicester on 10th January. Commencing with the company in 1895, Mr. Waddington subsequently became works manager. He was elected works director in 1917 and appointed joint managing director in 1936. On the death of Mr. Hardy Parsons he became managing director in 1940. In March, 1945, he was joined in this position by Mr. H. Kelvin Parsons but relinquished the joint managing directorship in December, 1945, on retirement but retained his seat on the board of directors.

Mr. J. Williams.—The death occurred on 13th January of Mr. John Williams, M.M., who was north eastern area manager of the General Electric Co., Ltd. Mr. Williams joined the G.E.C. in Newcastle in 1913 and after war service transferred to Cardiff as manager of the supplies department. He was manager of the Gloucester branch from 1931 to 1941 and assistant area manager, Cardiff district, from 1941 to 1949.

Mr. J. L. Daniels.—Following a car accident near Derby on 9th January, the death has occurred of Mr. J. Lionel Daniels, of T. H. & J. Daniels, Ltd., Stroud, Glos.

INDUSTRIAL NEWS

Electric Cable Makers' Federation

The Electric Cable Makers' Federation held its inaugural meeting in London on 7th January. Its initial membership consists of about forty British cablemakers, almost the whole of the industry. The Federation has come into being through a strong and widespread desire on the part of cablemakers to establish an industry body to act as a forum at which problems of the industry and matters of common interest can be discussed on the widest basis. The Federation will not be concerned in any way with price fixing or any other related activities, nor will it replace the existing Cable Makers' Association, Independent Cable Makers' Association or other similar trade associations.

At its inaugural meeting, the Federation elected Mr. F. Waine, J.P., director of British Insulated Callender's Cables, Ltd., and Mr. S. Geipel, chairman of Williams Geipel, Ltd., as its first president and vice-president respectively. The first meeting was devoted mainly to constitutional matters, but it is expected that the Federation's work will be quickly commenced through elected committees. The present address of the Federation is Dickens House, 15, Took's Court, Chancery Lane, London, E.C.4.

Dumping Duty on Silicone Fluids

The Board of Trade has made the Anti-Dumping No. 1 Order, 1958, under the Customs Duties (Dumping and Subsidies) Act, 1957, imposing an anti-dumping duty of 4s per lb on polymethylsiloxane fluids (silicone fluids) originating in France and manufactured by the Société des Usines Chimiques Rhone-Poulenc in order to offset the dumping of these goods in the United Kingdom. The Order came into force on 7th January. Copies of the Order (S.I. 1958 No. 2) are available from H.M. Stationery Office, price 2d. This is the first Order made under the Act.

Electrification Contracts

Contracts, valued at £5 million, for the supply and installation of overhead conductor equipment for the electrification of 415 track miles in the Eastern and London Midland Regions have been placed by British Railways with British Insulated Callender's Cables, Ltd., and British Insulated Callender's Construction Co., Ltd.

The new equipment, for operation at 25 kV, single-phase, 50 c/s a.c., will be installed between London (Fenchurch Street), Tilbury, Southend and Shoeburyness—170 track miles; between London (Liverpool Street), Enfield, Chingford, Hertford and Bishop Stortford—105 track miles; and between Liverpool and Crewe—140 track miles. The last named scheme is the second stage in the complete electrification of the main line from London (Euston) to Crewe, Manchester and Liverpool.

Current will be collected from 0·166 sq in cadmium-copper contact wires suspended from 0·101 sq in catenaries made up of 19 strands of 0·083in diameter cadmium copper.

An extensive research and testing programme has been undertaken to determine the most suitable types of insulators for supporting the catenary wire on the steel structures. On double tracks the conductors will be supported by copper-clad steel cantilevers attached to, and insulated from, galvanised-steel masts at the sides of the track. For more than two tracks a new type of portal structure has been designed to avoid obstruction to the sighting of signals, to reduce weight and to give a good appearance. It is constructed with angles as the main members and with rod-bracing welded to the toes of the angles. The structures are completely galvanised after fabrication. The contracts will require about 11,000 tons of steel.

E.D.A. Publications

"Cheaper Heat from Off-peak Power" is the title of E.D.A. pamphlet No. 1811 produced by the British Electrical Development Association. Its aim is to give succinct information about electric storage heating and it covers the use of the block-type heater (so far available only for commercial or industrial installation), electric floor-warming and hot-water storage heaters. The illustrated descriptive matter is introduced by notes on off-peak tariffs offered by some of the Electricity Boards, emphasising the low running cost in these circumstances, as well as the cheapness of installation, the ease of control, etc.

It may not be generally realised how much the British Electrical Development Association has done to stimulate the application of electricity in agriculture and its ancillary industries. In its booklet No. 1806 the Association sets out the aids which it has made available to farmers and horticulturists. There are booklets on electricity in crop farming, stock rearing, dairy farming and poultry husbandry in many applications. Technical books, broadsheets, leaflets, films and filmstrips and scale models are also obtainable from the Association at 2, Savoy Hill, London, W.C.2.

Scottish Window Display Competition

The South of Scotland Electricity Board has a competition for the best window displays by its service centres for which trophies are awarded annually. Prizes for the 1957 competition were recently presented to the successful service centres by Mr. J. W. Moule, chief commercial officer of the Board. These were:—League "A" (large centres): First, Dumfries; second, Waterloo Street; third, Stranraer. League "B" (medium centres): First, West Calder; second, Galashiels; third, Largs. League "C" (small centres): First, Dalbeattie; second, Maybole; third, West Kilbride.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £197 0s 0d
COPPER, H.C. Electro	ton £173 15s 0d
Fire Refined 99·70%	ton £172 0s 0d
Fire Refined 99·50%	ton £171 0s 0d
COPPER Tubes ..	lb 1s 8¾d
Sheet	ton £205 10s 0d
H.C. wire and strip ..	ton £225 5s 0d
LEAD, English ..	ton £72 10s 0d
Foreign	ton £71 0s 0d
MERCURY	flask £70 0s 0d
TIN, block (English) ..	ton £730 5s 0d
ZINC, G.O.B. Foreign	ton £62 15s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 5¼d
Sheet	ton —
Wire	lb 2s 2¾d
PHOSPHOR BRONZE Wire	lb 3s 6¼d
PLATINUM	oz £28 10s 0d
RUBBER, No. 1 R.S.S. spot	lb 23¼d—23¾d

Disposal of Cadmium Stockpile

The Board of Trade announces that in accordance with the policy set out in the 1956 Defence White Paper on running down strategic holdings of industrial raw materials, they intend to dispose of 12½ tons of cadmium metal in rod form. This material, which represents the final balance of the stockpile, is being offered immediately for sale by open tender for delivery before the end of March, 1958. Forms of Tender are obtainable from the Board of Trade, General Division 7, Lacon House, Theobalds Road, London, W.C.1.

Tubular Engineering Film

Last week we attended a preview of a new sound film entitled "Tubular Engineering," produced on behalf of Stewarts & Lloyds, Ltd., 41, Oswald Street, Glasgow, C.1, showing the use of hollow section for structural purposes. Among the varied constructions shown are transmission towers and conveyor bridge systems at power stations. The 603ft self-supporting radio mast at Gibraltar is also shown.

The film, in black and white, was

produced by Ace Distributors, Ltd., and has a running time of 26 minutes. Loan of the film, in 16 mm or 35 mm, is free to approved borrowers at home and overseas on application to the nearest Stewarts & Lloyds branch.

A.S.E.E. Examination Recording

A tape recording has been produced by the Education and Training Committee of the Association of Supervising Electrical Engineers to demonstrate the procedure adopted at the oral examination conducted under the A.S.E.E. Diploma Scheme. The purpose of the recording is to help members of the Committee giving talks about the scheme to convey the right impression of the informal yet efficient way in which the oral tests are conducted.

Disposal of Government Lead

The Board of Trade announces some minor changes in the plans, announced in December, for the disposal of lead from the Government stockpile in the first six months of 1958. The total quantity of lead for disposal in that period (including tonnages already sold) is now 6,700 tons, instead of the 7,200 tons referred to in the previous announcement. Of this 6,700 tons, a total of 4,400 tons (including the 1,900 tons which was so offered in December) will be available for sale by open competitive tender. Tender forms in respect of the further 2,500 tons now offered are available from the Board of Trade, G.7, Room 316, Lacon House, Theobalds Road, London, W.C.1, for return by 28th January.

Equipment for Hunterston Power Station

Accles & Pollock, Ltd., Oldbury, Birmingham, are supplying prefabricated assemblies for the burst-slug-detection installation in the nuclear power station being built by the General Electric Co., Ltd., at Hunterston, Ayrshire.

Attractions at Electrical Engineers' Exhibition

A giant motor will be on show at the 1958 Electrical Engineers' Exhibition which opens at Earls Court on 25th March. The motor measures 14ft in length, 9ft wide and 12ft high. It weighs 17 tons and will be mounted on a trailer unit weighing 10 tons and measuring 35ft by 7ft 6in. Because of its size and weight the motor (made by Laurence, Scott & Electromotors, Ltd.) will be displayed in the forecourt of Earls Court.

It is an 860/57 h.p., 790/316 r.p.m. motor and is intended to drive the cooling fan of a 100 MW set at Willington power station. It is one of two ordered by the Central Electricity Generating Board, which asked that it should be immediately available in case of urgent need. That is why the motor will be mounted on a trailer throughout the five days of the exhibition.

"Mr. Pylon," emblem of the exhibition, will be animated this year. He will be shown on the backcloth and will be illuminated. He will be double-headed and by the flashing of lights the impression will be created that he is turning his head from side to side. He will be looking at two sets of figures—the area occupied by the Electrical Engineers' Exhibition in 1953, the first year it was held at Earls Court, and the area to be occupied in 1958. In 1953 it was 80,000 sq ft, in 1958 it will be 450,000 sq ft. This illuminated backcloth and scenic background with supporting association badges will measure 160ft by 30ft.

Miss E. Oddy, the champion country cook, using a "Falco Royal" cooker for her prize-winning effort

"Light and Lighting"

The January issue of *Light and Lighting* is a special one marking the journal's golden jubilee. Mr. H. C. Weston contributes a history of the journal which in its fifty years has had only three editors—Messrs. Leon Gaster and J. S. Dow, now both deceased, and Mr. G. F. Cole, the present editor. The rest of the issue is devoted to well-illustrated reviews of progress in the various branches of the illumination art.

New English Electric Offices

The English Electric Co., Ltd., has accepted the tender of Taylor Woodrow Construction, Ltd., for the main contract to build the new office block on the site of the Gaiety Theatre, London. The new building, designed by Dr. C. Holden, of Adams, Holden & Pearson, will be eight storeys high, with a dominant main entrance facing down the Strand. Sculptural groups for either side of the main entrance have been commissioned from Sir Charles Wheeler, K.C.V.O., P.R.A. Work on the building, which is to be faced in Portland stone and have aluminium alloy windows, will begin in the next few weeks. The contracts for services, heating fixtures, fittings and so on will be awarded shortly.

Cookery Contest

The annual contest for the champion country cook, organised by the *Farmer & Stock-Breeder*, was held recently at the National College of Domestic Subjects in London. The winner of the 1958 title, Miss E. Oddy, who lives on a farm near Halifax, is seen in the accompanying picture preparing her prize-winning meal on a "Falco Royal" cooker.

Prestcold Frozen Food Fair

In conjunction with well-known frozen food manufacturers and distributors, Prestcold Refrigeration is holding a frozen food fair at the South Eastern Electricity Board showrooms, Electric House, Wellesley Road, Croydon, Surrey, on 21st, 22nd and 23rd January.

New Lighting Showrooms

Philament Electric, Ltd., has opened a new showroom at Kent Road, Industrial Estate, Bridgend, Glamorgan. The decor is in an attractive garden setting, with a total area of 800 sq ft. Over 200 ceiling fixtures and wall brackets are on display, covering a wide range including traditional, contemporary and commercial. The showroom is at the disposal of the wholesale trade and the company's customers.

Y.E.B. Christmas Window Display Competition

The customary Christmas window display competition amongst the seventy-nine service centres in the Yorkshire Electricity Board's area took place shortly before Christmas. As before, the service centres were divided into two groups—class "A" for service centres with a total window frontage of over 20ft, and class "B" for all other service centres. A silver cup, to be held for twelve months, is awarded to the winning service centre in each group. Before the final judging took place there was a preliminary selection of the best windows in each group in each Sub-Area. The winning service centres so selected represented the Sub-Area in the area competition. The displays were judged by Mr. A. Haselhurst, the Board's chief commercial officer,

and Mr. S. Agnew Mercer, director of Tattersall Advertising, Ltd. Their choice was Hull (also winners in 1956) in class "A" and Holmfirth (runners-up in 1956) in class "B" with Grimsby (Victoria Street) and Tadcaster as the respective runners-up.

Lamp Price Reductions

Prices of clear and pearl coiled-coil tungsten lamps marketed by the Stella Lamp Co., Ltd., and Philips Electrical, Ltd., have been reduced as follows with effect from 15th January:—40-60 W, 1s 5½d (plus 3½d purchase tax); 75-100 W, 1s 11d (plus 5d purchase tax).

Industrial and Factory Law Course

A course on industrial and factory law will be held under the auspices of the Industrial Welfare Society on 4th, 5th and 6th February at Robert Hyde House, 48, Bryanston Square, London, W.1. Mr. H. Samuels, M.A., barrister-at-law, will be the lecturer. Particulars can be obtained from the administrative officer of the Society at 48, Bryanston Square, W.1.

Domestic Equipment Survey

Owing to the pressure of other commitments, the next survey in our domestic electrical equipment series has been deferred from the 31st January to the 7th February issue. The subject will be spin and tumbler dryers.

I.E.E. North-Western Centre

The annual dinner-dance of the Utilisation Group of the North-Western Centre of the Institution of Electrical Engineers will be held on 7th February at the Embassy Suite (Locarno), Sale (6.45 for 7.15 p.m.). Tickets (26s each) can be obtained from Mr. W. F. Jarvis, Group hon. secretary, North Western Electricity Board, No. 1 Sub-Area, Town Hall, Manchester.

Trade Announcements

Metropolitan Tool & Products, Ltd., Nottingham, has appointed the **Midland Electric Installation Co., Ltd.**, Cyprus Works, Upper Villiers Street, Wolverhampton, as its agents for "Metool" cable reels for the counties of Staffordshire, Warwickshire, Shropshire and Worcestershire.

The **London Electrical Co. (Blackfriars), Ltd.**, has opened a new branch at 2-4, Dudley Street, Luton, Beds. (telephone: Luton 8100). The new branch includes a trade counter and provision has been made for showrooms.

As from Monday, 20th January, the Nottingham area office of **Lancashire Dynamo Group Sales, Ltd.**, will be at 2, St. James's Terrace, Standard Hill, Nottingham (telephone: Nottingham 43025).

Mr. K. W. Swift, who has been turnery buyer for **Chiesmans, Ltd.**, Lewisham, S.E.13, since February last year, has now also been appointed buyer for the company's Electrical Department.

Mr. A. C. Woollard, formerly second sales engineer at the Plymouth office of **Brook Motors, Ltd.**, has been transferred to its Swansea office in the same capacity.

Aerialite, Ltd., has opened a new distribution centre at 311, Bell Street, Glasgow, C.4 (telephone: Bell 2014/5).

The firm of **A. Pearce (Birmingham), Ltd.**, makers of the "Apco" range of automatic and non-automatic kettle immersion elements and specialists in the insulation of bars and tubes in micanite and Bakelite, has recently changed hands. The new managing director, Mr. R. L. McIntire, is also owner and managing director of the Stoekfield Mfg. Co., Ltd., metal spinners. Mr. J. Pearce, son of the former owner and managing director, remains on the board of A. Pearce (Birmingham), Ltd. Mr. McIntire is completely reorganising this business and plans to greatly increase production.

The main construction work on the new factory now being built for **Semiconductors, Ltd.**, at Cheney Manor, Swindon, Wilts., is now almost complete. Clad entirely with aluminium panelling, the factory has no windows and all internal surfaces are coated with p.v.c. Installation of equipment will commence during the next few weeks and it is anticipated that the factory will be in production by mid-1958.

Change of Address

The Association of Street Lighting Erection Contractors has moved to 36, Ebury Street, Victoria, London, S.W.1 (telephone: Sloane 0341/2).

Mine Winder Equipment for N.C.B.

THE British Thomson-Houston Co., Ltd., as main contractor, has received a large order from the National Coal Board, North Eastern Division, for four mine winder equipments and associated plant to be installed at a new colliery at Kellingley, North Yorkshire. Delivery is due to commence before the end of 1959.

The winders, which will be of the friction type, will be tower-mounted. The adoption of this form of winder at the start has the advantage that the temporary head gear and special winders usually employed for sinking the shafts will not be necessary. There will be two shafts (upcast and downcast) at this colliery and two winders will be employed in each shaft. The downcast winders, which will incorporate cages and counterweights and will normally carry men and materials, will each be driven by a 1,100 h.p. 11 kV slipring induction motor with reduction gearing. Fully-automatic control will be provided. The dynamic braking equipment will include germanium power rectifiers and power magnestats.

The two upcast shaft winders, which will be used for coal raising, will incorporate skips and counterweights, and will in this case each be driven by two 1,100 h.p. slipring induction motors with common gearing. Again, dynamic braking equipment and a fully-automatic control system will be provided. A total of seven identical winder motors will be supplied, six to be installed for the winders described and one to be supplied as standby plant. Other equipment will include h.v. switchgear, motors, control gear for the winder motors and auxiliaries, liquid rotor resistances, and transformers. The mechanical parts for the winders will be supplied by M. B. Wild & Co., Birmingham.

Two orders covering four 2,500 h.p. electric winders and approaching £500,000 in value have also been placed with the Metropolitan-Vickers Electrical Co., Ltd., by the North Western Division of the N.C.B. Two of the winders will be installed at Agecroft Colliery, which is being reopened and modernised; the other two are for a new mine, the first in Lancashire for over thirty years, which is being sunk at Parkside, near St. Helens. Both collieries will together eventually produce over 2,000,000 tons of coal a year.

The new winders will be of the four-rope, tower-mounted friction type and will be driven by d.c. motors supplied from mercury arc convertors. Each of the 2,500 h.p. 800 V d.c. winder motors will obtain its supply from a bank of four pumpless steel-tank rectifier units with a grid control unit for the whole bank. The rectifiers will be supplied from transformers each consisting of two 12-phase units connected together to give 24-phase operation and to reduce harmonic distortion on the 11 kV mains supply. The transformers will be immersed in a non-inflammable coolant.

At each colliery, one winder will operate with a skip and counterweight and the other will operate with a cage and counterweight. The skip winder will be used mainly for hoisting coal from a number of horizons and will be automatically operated under the control of the banksman. The cages will carry men and materials and the winders for them will be manually operated, having a closed loop control system.

The mechanical equipment for each winder will be manufactured by Vickers-Armstrongs (Engineers), Ltd., and will consist of a four-rope friction wheel, 12ft in diameter, driven through single reduction double-helical gears supplied by Turbine Gears, Ltd.

PRODUCTION, CONSUMPTION AND PRICES IN 1957

Materials for the Electrical Industry

WE present below our customary annual review of the course of events in the production and use of the leading materials used in electrical manufacturing. It has been prepared for us by the Metal Information Bureau, Ltd.

COPPER.—After the remarkably heavy recession in prices of copper in the last nine months of 1956 it was hoped that the market would show more stability during 1957, but although price movements during that year were not on quite such a large scale as in 1956, the price dropped £85 a ton, bringing it to the lowest level since open market trading in copper was resumed after the war.

The basic reasons for this continued setback are two-fold: firstly the continued upward trend of primary production following the period of high prices for the metal in the early 1950's which greatly stimulated the search for, and development of, copper mines. The other factor was a recession in United States consumption, in line with the generally quieter economic conditions in that country.

The net result was a further sharp rise in producers' stocks of refined copper during the year from 354,420 short tons at the end of 1956 to 425,678 tons at the end of November, 1957. This occurred despite the fact that as prices receded there was, not unnaturally, a tendency for production to be cut in various directions. In total, it is estimated that output cuts at the rate of about 200,000 tons a year were made at various times during the year, but these were fully offset by new production coming in as total output appears to have shown little change on the year.

With copper prices now much below £200 a ton, producers are no longer concerned about the probable substitution of aluminium for copper in the electrical industry, or plastic tubing for copper tubes in building and agriculture. Nevertheless, during the period of very high prices, a good deal of ground was lost in the electrical field and owing to the complications and expense of re-tooling, etc., there appears to have been no noticeable reversion to copper. The copper wire industry in the United Kingdom was very active in 1957, production in the first eleven months (the latest figures available) showing an increase of about 9 per cent at 246,974 tons. This was due in some measure to the further progress in exports of wire, much of it to the Soviet Union and its satellites. Further Russian orders have been placed for the opening months of 1958, and if these are renewed, the wire industry should be able to look forward to another good year.

At around its present level of £175 a ton copper is uneconomic for a good many mines, but nowadays, socio-political factors are so important in many parts of the world that the price mechanism no longer operates as effectively as it used to do in adjusting supply to demand by forcing higher cost producers out of production. It is thought that world output is currently running at around 200,000 tons or more in excess of consumption, so that unless further restriction of output is undertaken, the depressed condition of prices may persist for some time. Last week Chile announced an adjustment in copper production which will mean a 10 per cent reduction on the 1956 figure.

An interesting development during the year was the abandonment of the fixed selling price scheme (for United Kingdom consumers) of the Rhodesian Selection Trust. This was initiated originally during the boom in prices, at the request of users, in an attempt to prevent runaway prices, and at times there was a very wide difference between the R.S.T. quotation and that of the London Metal Exchange open market. The existence of dual pricing created many complications for users of copper, and with business in copper and copper alloy products becoming progressively more competitive, the consumers felt obliged to ask for the discontinuation of the scheme, after lengthy discussions had proved that no alternative could be found which was acceptable alike to consumers and both the big Rhodesian producing groups.

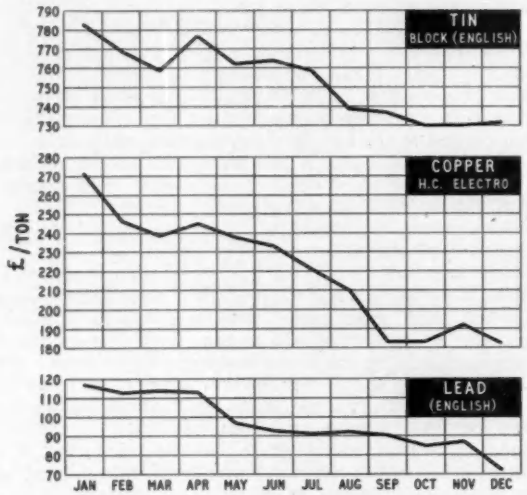
In August, the Board of Trade announced that it intended to dispose of a further 27,000 tons from its stocks later in the year, but in view of the unfavourable state of the market, and the protests of various interested parties, sales were twice postponed and the present position is that nothing will be done until after a further announcement by the Government has been made. At one stage during the year, namely when prices were in the region of £240 a ton, some very substantial buying on the open market was seen on behalf of certain producers in an endeavour to stabilise prices, but this failed to achieve its object. It resulted, however, in quite a sharp rise in stocks in official Metal Exchange warehouses and with further surplus supplies gravitating to the open market later in the year, L.M.E. warehouse stocks rose by around 16,000 tons during the year to over 20,000 tons. One beneficial result of this was the emergence of a contango in prices, which greatly facilitates hedging operations.

Of considerable long-term significance to the copper and brass trade of this country is the coming into being of the European Common Market on 1st January and the possibility that this may eventually be added to by a European Free Trade Area. Such a development would undoubtedly pose many problems for British fabricators and one result has been the announcement of the merging of the Yorkshire Copper Works, Ltd., and the tube-making facilities of the Metals Division of Imperial Chemical Industries, Ltd. If free trade in copper products became a reality, further readjustment to manufacturing organisations in the United Kingdom might be seen. It will be recalled that as a result of the Monopolies and Restrictive Trade Practices Act, price fixing by trade associations for copper and brass products virtually ceased during the year under review but, with a system of price leadership emerging, quotations for products presented a fairly stable picture except in so far as they varied with market fluctuations in the raw metal.

TIN.—The first full year of operation of the International Tin Agreement during 1957 was a fairly eventful one. At the end of January, the tin smelter at Texas City, owned by the U.S. Government, was sold and production

ceased. This meant that a substantial tonnage of tin which had been going into the American stockpile gradually came on to the open market, as the concentrates from Bolivia and elsewhere treated at Texas were diverted to the United Kingdom and the Continent of Europe. This, coupled with a downward trend in the demand for tinplate and in other tin consumption, notably in the United States, resulted in a fairly substantial surplus of production over consumption, which was aggravated by sales of Russian tin on the European market on a larger scale than most people had anticipated.

As a result, prices which were in the region of £780 at the beginning of 1957, after climbing to just over £800, began to decline sharply. However, in March the International Tin Council raised the minimum price under the International Tin Agreement from £640 to £730 a



ton and for the remainder of the year the cash price did not fall below £730. Nevertheless, the Buffer Stock—operating under the terms of the Agreement—was called on to buy large tonnages in order to maintain price stability. At one time—in October/November—fears developed that it would have insufficient funds to absorb all the surplus metal offering, with the result that forward tin was selling at £50 a ton below the spot price. To save the situation, producing countries in the Agreement were called on for a second contribution to Buffer Stock funds equivalent to 5,000 tons of tin at £730 a ton (the first contribution was for 15,000 tons at £640 a ton) and export quotas were introduced for three months with effect from 15th December. These cut permissible exports from the signatory countries by an overall figure of 28½ per cent.

Although this restored confidence in the viability of the International Tin Agreement, the market has so far continued dependent upon Buffer Stock support for the maintenance of prices around £730 a ton, despite the fact that many observers consider that a period of scarcity may develop. To prevent the possibility of a runaway market in an upward direction, the International Tin Council decided in December to empower the Buffer Stock manager to sell tin, if he thought fit, within the middle price of the Agreement, namely between £780 and £830 a ton.

This year opened with world consumer demand at a lower level than for some time, mainly owing to the recession in America, and the likelihood that, even if the present sharp cut in exports is not fully maintained after 15th March, some curtailment of shipments will continue to be necessary. It is possible, however, that when the present cut in exports becomes fully effective at consuming points, a temporary scarcity of supplies may develop. The sharp cutback in exports has, of course, caused serious problems and redundancy of labour at the mines.

LEAD.—From one point of view, 1957 was an uncertain year in lead. During the course of the year, prices fell from nearly £120 a ton to not much over £70 a ton. From a market point of view, such a weakness must always be considered bad: from the producer's point of view the serious—not to say in some cases tragic—repercussions are only too obvious. It is, however, unfortunately also true that a price decline of this nature is frequently also unsatisfactory from the consumer's point of view. A lead cable extruder, for example, unless he has hedged his stocks adroitly, is likely to be faced with a greater or less bill for stock losses during the course of the year. The reasons for the decline are not very far to seek, and to a great extent they emanate from the United States. It should at once be made clear, however, that the weakness of lead prices is, in the last resort, merely a function of the re-crossing of the production and consumption graphs after the boom market and tight supplies of 1956.

Seriously interfering with the normal interplay of economic development, however, has been American political action. Ever since the United States authorities' programme of support buying of lead and zinc from domestic mines was introduced in the summer of 1954, market observers have been preaching that introducing an artificial factor of this nature could only have adverse repercussions on the market ultimately. Although American Government buying of domestic lead and zinc for the stockpile continues, it is not at the same rate as formerly and its life now is of definitely limited duration. Even more serious than the reduced level of buying from domestic mines has been the almost total cessation of the programme for obtaining lead and zinc, amongst other metals, from external sources by the barter of surplus agricultural goods.

Later in the year moves were made to secure higher protective tariffs on lead and zinc entering the United States, as it was claimed that competition from overseas supplies was causing hardship to domestic mines. At the time of writing, the position appears to be that the increases called for from the U.S. Tariff Commission (whose powers are statutorily limited to recommending a restricted increase in the duties) will be achieved, but possibly not before March or April. It is perhaps supererogatory to explain that these anticipated duties have not so far advanced, and are now not expected to advance, the price of lead and zinc in the United States but merely to depress prices on other markets. Indeed, on the London market, prices have already declined by an amount equal to the additional penalty that would be incurred by metal entering the United States after any increase in the rates of duties, but, even so, there seems to be no assurance that at this level prices have "found bottom."

Among the additional bearish factors which have had to be countenanced was the announcement late in the year that the British Government was to release a further quantity of lead from its strategic stocks in early 1958.

The outlook for 1958 is not very full of promise from a market point of view, although so far as consumers are concerned, the risk of further heavy stock losses through

declining prices is much reduced. A more healthy, and, one hopes, a more stable market position can ultimately only emerge when the world's mine output is brought to a less oppressive level or consumption shows a substantial —and at present unanticipated—recovery.

ZINC.—The three fundamental market factors outlined in connection with lead have acted with equal force on the zinc market. For the sake of clarity we repeat that these have been the general shift in the world economic situation especially as it affects commodities; a reduction in offtake by the American Government, particularly from producers outside the United States; and the threat of increased American protective tariffs during at least the last three months of the year. It should also be recorded that the British Government added its unwanted weight in depressing the market by announcing the release in August of 27,000 tons of metal from its strategic stocks, spread over a period of about nine months.

A factor which distinguishes zinc from lead and has been in part responsible for its inherent greater weakness during most of the year, has been the heavy quantities of metal of Russian and Eastern bloc origin offered on the European market. For the most part this metal has been high grade, but its effect has been reflected in the markets for all grades. The fact that the zinc market has been even more depressing to study than lead during 1957 is not solely attributable to Russian offerings of the former metal. Part of the answer is to be found in the applications of zinc: particularly in the United States, the consumption of zinc in die-casting by the motor car industry has fallen away rather seriously, while in Europe the brass trade has not enjoyed the conditions of recent years. General galvanising, too, was less active.

Zinc mine production is now being reduced in many parts of the world and, in addition, mines are tending to accumulate stocks of concentrates so that, as might be expected, the fundamental law of supply and demand will ultimately bring about a stabilisation of the position. The intervening period, which is by no means yet over, however, has its problems.

ALUMINIUM.—From a buyer's point of view, 1957 provided a good deal fewer troubles in connection with aluminium than did 1956. The shortage which characterised the early part of the latter year was a far cry from the market position in almost all of 1957. When it is considered that these conditions have prevailed despite the closing for about four months of the huge Arvida works of the Aluminum Co. of Canada, the principal source of raw aluminium for the United Kingdom, through a strike, at the cost of some 15,000 tons of output, it will be appreciated that the shift which has taken place in the global supply and demand position has been quite substantial.

Final figures are not yet available, but it looks as though world consumption of aluminium in 1957 will not have been less than the 1956 total, although it will clearly have increased less than the post-war historical average of almost 10 per cent per annum. World production, on the other hand, has been augmented by the maturing of various expansion plans laid down two or even three years ago. By the end of 1957, the excess of supply over demand had reached such obvious proportions that delaying tactics began to be applied to certain current expansion plans and actual cuts in the output rate have been made deliberately by various producers. As an example of the former may be cited the decision of the Aluminium, Ltd., group to re-phase part of its expansion at Kitimat, British Columbia, to give a smaller increase in capacity there than was originally intended. In the latter category may be cited the 30 per cent reduction in the operating rate at the Lippewerke of the big German producer, which was dictated by market considerations. Other producers, too, have been shading their actual production rate, although not all have been entirely honest in citing reasons for their action.

In an open or terminal market, of course, the change in the situation would have brought about a substantial change in the price, but as aluminium prices have historically been determined, at any rate on the European market, primarily by the world export quotation of Aluminium, Ltd., a large number of consumers have felt no price advantage from the changed supply position. Nevertheless, particularly in the latter part of the year, metal has been available, in the United Kingdom and Europe, at up to £14 per ton under the group's going base price. The Canadians countered these offers (which, of course, emanated from Soviet bloc sources), by lowering their base price on the Continent, and, in the United Kingdom, by offering "loyalty" rebates to consumers, as well as affording consignment stock facilities to many more important users. This gesture has prevailed effectively with many consumers, especially larger ones, but it did not prevent a good deal of speculation at the year end on the possibility of a good reduction in the selling price of Canadian aluminium. Indeed, the possibility of a lower base price at some time in 1958 must remain in buyers' minds, unless they disregard basic economic theory altogether.

RUBBER.—The rubber market did not escape the general downward trend in commodity prices during 1957. No. 1 ribbed smoked sheet on the London market fell from an average of about 2s 4d/lb in January to 1s 10d in November, subsequently recovering to between 1s 11d to 2s. World production of natural rubber was fully maintained, amounting for the twelve months ended 31st October to 1,922,500 tons (an increase over the preceding twelve months of 20,000 tons) whilst that of synthetic in the first ten months of 1957 totalled 1,027,000 tons, compared with a consumption in the same period of 1,052,000 tons.

Consumption of natural rubber remained fairly steady, being 1,905,000 tons in the twelve months to 31st October (against 1,907,000 tons), despite the less favourable conditions prevailing in the American motor car industry and, in the early months of the year, also in the British motor industry. As will be seen, synthetic rubber now accounts for a substantial proportion of the total world demand and in the cable industry in this country appears to have made further progress in the past year, since in the first nine months it accounted for nearly 22 per cent of the total consumption of rubber in cables, compared with 16·7 per cent for the whole of 1956. At the end of November, 1957, stocks of natural rubber in the United Kingdom were some 14,000 to 15,000 tons higher than at the end of 1956; the end-1956 figure was a rather low one and the broad picture has not changed materially in this respect.

Having regard to the recession in industry generally in

the United States, including motor car production, it cannot be said that the early prospects for 1958 are particularly encouraging, but political unrest in Indonesia may have the effect of slowing down supplies of natural rubber from that source.

IRON AND STEEL.—The past year has seen a considerable change in the general situation in the British iron and steel industry. At the beginning of 1957 the mills held very good order books despite a record production during 1956 and imports were still at a high level, although declining. Figures published last week showed that production in 1957 amounted to 21·7 million tons (against 20·7 million tons) which was about 3 per cent lower than the estimate.

During the spring new output records were achieved, but after the summer holidays, production failed to rise to the new heights hoped for earlier. This, the first serious recession since the war, was confined to a few products, but there were indications that it might spread during 1958.

The item most seriously affected was tinplate. World demand for tinplate had been reduced by disappointing harvests, and this had come at a time when output was being rapidly expanded, both here and abroad. The big new Velindre works produced at a more rapid rate than envisaged—it had not reached full capacity—and one by one the old style hand mills went to the wall. Their higher cost and poorer quality product was not needed, and by the end of the year only a few of them were still in operation, and even those were on short time. It is very doubtful if they will survive 1958. The closing of many old plants did not solve the problem, however, and makers turned to the export market. Conditions were very competitive, but exports were stepped up prodigiously, although not sufficiently to prevent short-time working at the three modern cold reduction plants.

As a result of the tinplate recession, some old steel-making capacity in Wales was closed down. No alternative markets for their steel could be found as, because of heavy imports, supplies of semi-finished steel were adequate and capacity for urgently-needed products such as plates was already fully supplied. The demand for light sections also fell off during the year, and although requirements of heavy sections for construction were still formidable, Government credit restrictions were beginning to make themselves felt. This cannot be blamed entirely for the fall in demand for certain products, as some easing had been noted before, but it certainly accelerated the decline, mainly by forcing consumers to begin liquidating their stocks.

The demand for plates was very heavy throughout the year, and at the moment capacity is inadequate to meet all the demands. Sheet steel, too, is urgently wanted, following a resurgence of activity in the motor car trade, although at the beginning of the year the mills had had to cultivate the export markets in order to dispose of their outputs fully.

The United Kingdom steel industry hopes to be able to produce as much or a little more in 1958, although it will have the capacity to produce something like 23·5 million tons were there the demand. The outlook for the coming year is uncertain. 1957 has shown how rapidly conditions can change in the industry, both generally and specifically as regards a particular product.

Imports, which have declined considerably over the past few months (with the exception of sheets which have gone up), will continue to fall as the home industry will be able to supply most products in adequate quantities. Every effort will be made to increase overseas sales to offset the expected fall in home demand, but this will not be easy. In 1957 exports rose to a new record but conditions will be even more competitive in the next twelve months. Many other countries will be looking beyond their borders for outlets for their expanded steel industries.

The British steel industry is certainly equipped to meet its competitors, and it does not intend to slow down, so long as it can obtain the necessary finance for its ambitious expansion plans. Immediately there is going to be a quieter demand for steel, but by 1959 it is quite possible that every ingot ton will be needed.

Precautions Against Nuclear Radiation

FOLLOWING the recent accident at the Windscale, Cumberland, establishment, the Prime Minister appointed a Committee "to examine the organisation of health and safety in the United Kingdom Atomic Energy Authority," under the chairmanship of Sir Alexander Fleck (chairman, I.C.I., Ltd.).

In its report, published last week (H.M. Stationery Office, Cmnd. 342, price 1s 3d), the Committee considers that, now the nation is committed to a large nuclear power programme, it is of the first importance that the hazards of atomic energy should neither be exaggerated nor minimised in the public mind. The public, it says, can be assured that extremely elaborate precautions are applied; the underlying conception is to err on the side of caution.

It is thought, however, that the Windscale accident showed that the organisation was deficient but the Committee says that improvements in this will not suffice; there is an urgent need to clarify and strengthen the relations between the Atomic Energy Authority and the many Government Departments concerned with health and safety in the atomic energy field.

The Committee outlines the health and safety measures required and the parts to be played in this by Government Departments and the Authority. The siting of nuclear power stations by the electricity supply authorities is done with the agreement of the A.E.A. but the Committee expresses the view that a suggestion by the A.E.A. that the "licensing" of reactors by an independent body is not practicable at present. Only the A.E.A.'s staff are competent to exercise the judgment required. Nevertheless the proposal should be considered as a future possibility.

Control of the A.E.A. organisation is dealt with and the Committee endorses the Authority's decision to establish a committee of its Executive (the full-time members) to be responsible for the general supervision of all matters of health and safety. Similarly the health and safety organisations of the Industrial Group, the Research Group and the Weapons Group are reviewed and certain recommendations to strengthen these organisations are made.

Reference is made to the setting up of Standing Liaison Committees to keep the public assured and informed. The recommendations include the building-up of a specialist medical staff required for the control of health and safety, the establishment of a national training centre for health physics and nuclear safety staff and the ensuring by Government Departments that appropriate training is given in the public services and industries for which they are responsible.

Appendices to the report set out recommended terms of reference to the bodies responsible for health and safety.

H.B.C. FUSES— an End to Ageing?

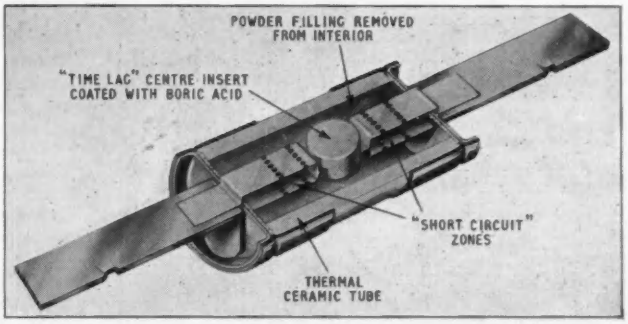

POWDER FILLING REMOVED FROM INTERIOR
"TIME LAG" CENTRE INSERT COATED WITH BORIC ACID
"SHORT CIRCUIT" ZONES
THERMAL CERAMIC TUBE

Fig. 1.—Constructional features of dual-element fuse

TWO new ideas were put forward by Mr. R. H. Dean in his paper entitled "Medium-Voltage High Breaking Capacity Fuse Links" to the Utilisation Section of the Institution of Electrical Engineers last evening, namely, that tests can prove a fuse to be unaffected by safe overloads, either temporary or continuous, and that the limitation of fault power and energy by a fuse on severe faults can be rapidly estimated.

The background to the paper was the development of a range of 600 V "Aeroflex" fuses manufactured by Parmiter, Hope & Sugden, Ltd., to suit Canadian requirements, which differ materially from British. Their single breaking capacity of 80 kA is sound, the author stated, since maximum conditions are not the most difficult for the modern fuse, and one category can economically cover all possible faults. They also require that a fuse should blow on a 35 per cent overload within a specified time. Semi-enclosed copper-wire or silver cartridge fuses which do not operate before a 75 or 100 per cent overload are not allowed in ordinary service. The author wonders whether the Canadians and the North American continent in general are ahead of us in this safety requirement and whether many fires from electrical causes might have been prevented had our regulations insisted on such a rule.

Dual Element Design

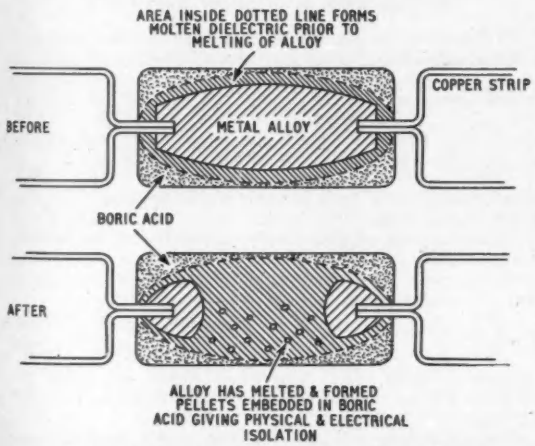
All requirements were met by the dual-element fuse described below (Fig. 1). In this the current passing through the element creates heat between the H.B.C. perforations. On heavy faults the heat melts these strips and forms the H.B.C. zone. On overload there is time for the heat to be conducted to the centre time-lag insert (Fig. 2). The operation of the time-lag insert is unusual.

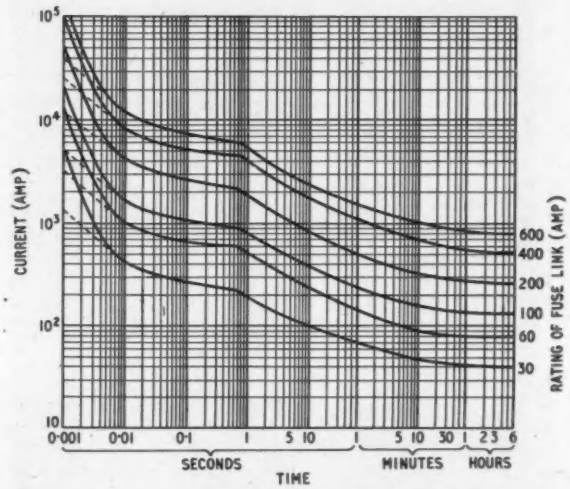
The lozenge of tin-lead alloy is cased in a box of boric acid which acts as a flux and an insulator. Before the alloy melts the boric acid liquefies but is retained by the frozen outer casing. When the alloy melts it runs into globules embedded in the insulating flux so that the circuit is broken by physical separation and electrical isolation.

The discontinuity in the time-current curves (Fig. 3) is the point of change-over of the fuse operating on the centre insert to operating on the H.B.C. perforations. In general, the time lags provided are ten times the rating for 1 sec, five times for 5 sec, and a minimum blowing current of 125 per cent of the fuse rating.

Deterioration Tests

Because these fuses provide both time lag and a low minimum operating overload it was thought desirable to demonstrate that no deterioration or ageing took place under any conditions short of the fuse blowing. It seems that, so far, non-deterioration has never been claimed or demonstrated for any H.B.C. fuse at currents greater than the full-load rating. The test was a continuous overload at 5 per cent less than the minimum blowing current for 40 hours, followed by overloads on the same fuse of six times the rating for 1 sec, 12 consecutive times, with


AREA INSIDE DOTTED LINE FORMS MOLTEN DIELECTRIC PRIOR TO MELTING OF ALLOY
COPPER STRIP
BEFORE
METAL ALLOY
BORIC ACID
AFTER
ALLOY HAS MELTED & FORMED PELLETS EMBEDDED IN BORIC ACID GIVING PHYSICAL & ELECTRICAL ISOLATION



Above: Fig. 2.—Section of centre insert. Right: Fig. 3.—Time-current characteristics

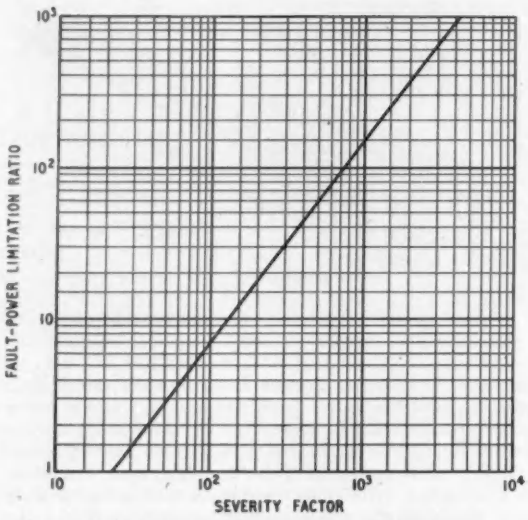


Fig. 4.—Curve for determining fault-power-limitation ratio

intervals for cooling to simulate motor starting surges. After each stage the cold resistance of the fuse is compared. An increase will show ageing. Finally, to prove that the fuse really has a low minimum fusing current the identical fuse must blow on this current plus 5 per cent. Figures in the paper show a 100 A fuse to Class P of B.S. 88 given a heat run of 118·7 A for 43 hours, then 600 A for 1 sec, 12 times, and finally to have blown on 131 A after 2 hr 5 min. Until blown the cold resistance remained unaltered at 640 microhms. Such tests are held to mark a step forward in design, as full confidence can be given to reliable operation and advantage taken of the time lag provided by a dual-element fuse. This enables fuse ratings to be reasonably related to motor full-load currents even on heavy starts. Fuses which have little time lag have sometimes to be so large to deal with the starting current that the cable size also has to be increased to accommodate the fuse in accordance with Rule 316 of the I.E.E. Wiring Regulations.

Operation on Severe Faults

On high prospective current the fuse operates so quickly that there is no loss of heat from the strips between the perforations and all the heat created by the resistance goes into melting this portion of the element. The physical characteristics are known and the energy required to raise them to arcing point calculated. This gives a constant called the pre-arcing constant, of which the units are amps² sec, and from it the operation of the fuse on various large prospective currents can be calculated.

Proof of the accuracy of this calculation is shown in Table 1, which puts the calculated and test figures provided by the Canadian Standards Association side by side. Considering the magnitude of the forces available, the closeness is remarkable.

TABLE 1.—COMPARISON OF CALCULATED AND TEST PERFORMANCES OF FUSES TO C.S.A. CODE 106; FORM 1; TEST CIRCUIT AT 600 V, 50 c/s, 0·114 POWER FACTOR, 80 kA SYMMETRICAL PROSPECTIVE CURRENT

Current rating	Pre-arcing time		Peak let-through current		Recorded arcing time
	Calculated	Recorded	Calculated	Recorded	
amp	millisec	millisec	kA	kA	millisec
30	0·17	0·15	6·0	illegible	0·55
60	0·31	0·26	10·9	illegible	0·62
100	0·42	0·37	14·7	12·0	0·71
200	0·78	0·82	27·3	22·0	1·54
400	1·25	1·10	42·9	35·0	2·70
600	1·70	1·50	56·9	47·0	3·50

TABLE 2

Fuse rating	Fault kA	Severity factor	Power-limitation ratio	Energy-limitation ratio
100	10	100	$\frac{1}{1}$	$\frac{1}{10}$
100	50	500	$\frac{1}{25}$	$\frac{1}{1000}$

Current, Power and Energy Limitation

A valuable feature of the modern fuse is that on severe faults the pre-arcing time of operation is less than a quarter of a cycle so that the rising current is broken before reaching full value. At approximately 20 times the rating these fuses will commence to limit, above this the admitted current will vary as the cube root of the potential current.

The limitation of current on heavy short circuits can be carried further to the limitation of power and energy. It can be estimated by Fig. 4, which shows:

$$\text{Severity factor} = \frac{\text{prospective current}}{\text{fuse rating}}$$

against

$$\text{Fault power limitation ratio} = \frac{\text{r.m.s. prospective current}^2}{\text{r.m.s. admitted current}^2}$$

In other words, the ratio of the power that would be circulated were the protecting device non-limiting to that which actually is admitted by the fuse. Multiplying this by the ratio of time of operation of the fuse compared with a circuit-breaker, which is assumed for convenience to operate in one cycle, gives the "energy limitation ratio." Table 2 sets out a typical example. In practice, a circuit-breaker may not operate in less than two cycles so that these ratios could usually be doubled.

This power and energy limitation facility of the modern fuse is of such a degree that it protects any ordinary circuit, consisting of cables, busbars, switches, etc., against damage from overheating or magnetic forces at any point no matter what the severity of the fault.

Inquiry into Exhibition Facilities

THE Grand Council of the Federation of British Industries has approved the appointment of a Committee of Inquiry to survey the adequacy of existing United Kingdom exhibition facilities in the light of the recent F.B.I. inquiry into future trade fair policy and of the possible entry of the United Kingdom into a European Free Trade Area; to ascertain the extent to which the requirements of exhibitors (including situation and size of buildings and sites, availability of halls at time required, physical equipment, and amenities such as catering and hotel accommodation) are met by existing facilities; and, in so far as they are not met, to draw up plans for new or extended exhibition facilities, including among other matters, estimates of cost and proposed position.

The members of the committee are Messrs. George Pollitzer (chairman), chairman, Beck & Pollitzer, Ltd. (exhibition contractors), R. W. Boardman, director, F. W. Bridges & Sons, Ltd. (exhibition organisers), and W. Marrable, head of the Exhibition Department, Imperial Chemical Industries, Ltd.

The committee will seek interviews with trade associations which sponsor trade fairs and will welcome evidence from others interested.

MANUFACTURING PROGRESS IN 1957

English Electric Co., Ltd.

ORDERS received by the Steam Turbine Division of the English Electric Co., Ltd., during last year included the turbo-alternators for Hinkley Point nuclear power station; there will be six 93·5 MW maximum load units for the station's main requirements, and three 33 MW m.c.r. variable-frequency sets. The contract for this 500 MW station was awarded to the English Electric/Babcock & Wilcox/Taylor Woodrow Atomic Power Group last September, and its total value, including land and other facilities, is about £60 million.

A further two 200 MW sets ordered by the Central Electricity Authority for the High Marnham power station completed the quota of five sets for the first 1,000 MW station in Europe. These sets are coupled in line, run at 3,000 r.p.m., and operate at 2,350 p.s.i., 1,050 deg F, with reheat to 1,000 deg F. The alternators are of the direct hydrogen-cooled type, generating at 16 kV with a rated gas pressure of 30 p.s.i.

For the Uskmouth "B" power station the company is to supply three 120 MW sets. These are three-cylinder machines, coupled in line, running at 3,000 r.p.m. and operating at 1,500 p.s.i., 1,000 deg F, with reheat to 1,000 deg F. The alternators are hydrogen cooled employing direct cooling of the rotor conductors only, and generate at 13·8 kV with a rated gas pressure of 30 p.s.i.

During the year, the first 100 MW set for Willington "A," the fifth 60 MW set for Marchwood, the fourth 60 MW set for Wakefield, and two further 30 MW sets for Mexborough, were commissioned.

Orders for export included a 50 MW turbo-alternator set for the New Brunswick Electric Power Commission's Seaboard station; these are 3,600 r.p.m. machines operating at 1,450 p.s.i., 1,000 deg F.

Overseas Transformer Contracts

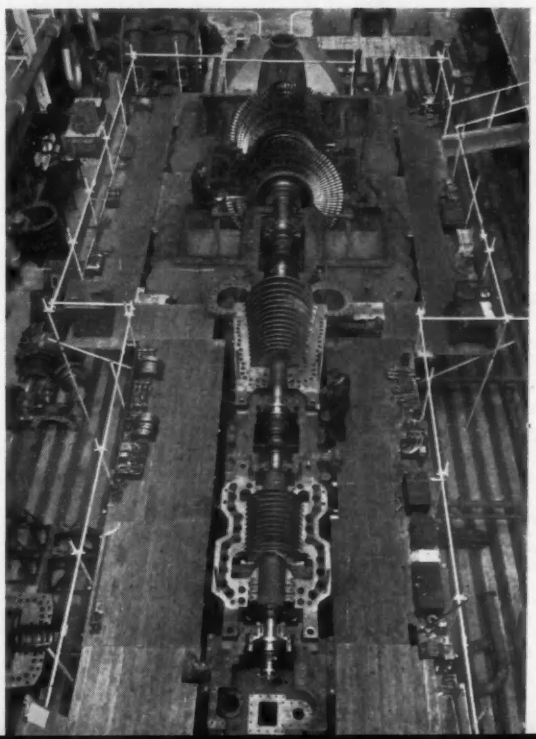
Transformer contracts placed in 1957 included three of 100 MVA for the Punjab, three of 100 MVA for the Damodar Valley and two of 85 MVA for the Pakistan Industrial Development Corporation. The first of the two 200 MVA, 165 kV units for the Tennessee Valley Authority, U.S.A., was recently dispatched. In this country, the contract for Hinkley Point nuclear power station includes six 110 MVA, 295 kV generator transformers, two 20 MVA, 275 kV station transformers, and associated auxiliary units. A further three 210 MVA, 295 kV generator transformers and six 120 MVA, 275/132 kV auto-transformers as well as various standard grid transformers were ordered by the C.E.A. A 20 MVA arc-furnace transformer with on-load tap-changing equipment was installed during the year at the works of Samuel Fox, Ltd. The demand for all types of distribution transformers further increased in 1957.

The switchgear activities were well maintained and, in the export field, contracts of particular interest included three 115 kV switching stations with bulk oil breakers for Shell, Venezuela, and three 33 kV switching stations ordered by Sofina (Belgium) for Baghdad. At home, the demand from the C.E.A. for 132 kV, 3,500 MVA and 275 kV, 7,500 MVA air-blast breakers was sustained. Orders included a seven-circuit 132 kV station at Norwich; an eleven-circuit 132 kV switching station at Capenhurst; a 275 kV station at Sundon and extensions at various other sites. Numerous indoor and outdoor substations were equipped and put into commission, the most notable being the 275 kV outdoor air-blast substation at Rochdale.

Last year many hydro-electric installations were commissioned. They included the first of the two main sets at Hirakud, India, rated at 37·5 MW; the first 25 MW set at Hume, Australia; the first 18 MW sets at Tully Falls, Tasmania; three 12·75 MW sets at Wayatinah "B," Rhodesia; and a 5 MW reversible pump and turbine set driven by an induction generator at Sron Mor in Scotland. In all these cases both the turbines and alternators were supplied by the company. In addition, the second 84,736 kVA alternator at McNary, U.S.A., and the first three pump turbines at Niagara (for the Hydro-Electric Power Commission of Ontario) were commissioned. Water turbine contracts received during the year included two 68,000 h.p., 128·6 r.p.m. vertical Francis turbines which were ordered by the U.S. Army Corps of Engineers for Table Rock, U.S.A., and six 69,500 h.p., 94·7 r.p.m. vertical fixed propeller turbines for the Quebec Hydro-Electric Commission at Bersimis. The C.E.A. placed a contract for four 105,000 h.p. vertical reaction turbines for storage pumps in connection with the Blaenau Ffestiniog pumped storage scheme.

The progress made by the Metal Industries Division in 1956 was maintained during the past year. Export contracts included equipment for a new rolling plant in South Africa. This involves the main twin drive for a 144in plate mill, capable of 2×5,000 h.p. (r.m.s.) at 40/100

100 MW turbine in course of erection at the English Electric works



One of six 52,500–45,000 h.p. pump turbines at Niagara

r.p.m. and a total peak (cut-out) torque of 492 metre-tons, together with a full set of auxiliary equipment, a new scale-breaker and a vertical edging stand for the existing roughing mill drive. Home market orders include one for three twin drives, each capable of 2×4,600 h.p. (r.m.s.) at 40/80 r.p.m. and having peak (cut-out) torques of 492 metre-tons. These will operate a 45in slabbing mill and two 144in plate mills. The contract also includes the three Ilgner sets, control equipment and all the auxiliary drives associated with the plant.

A new stage in the application of mercury-arc convertors was marked in 1957 by the first order placed in the United Kingdom for reversing rolling mills with mercury-arc convertors, instead of motor-generators, to feed and control the mill motors. The order covers two 750 h.p. mill motors, each with a 600 kW mercury-arc convertor. Grid control, together with the use of armature circuit reversing switches, makes possible forward and reverse operation and regenerative braking. Magnetic amplifiers interpret the operator's wishes by comparing the controller voltage signal with the output of a tacho-generator on the motor. Orders for grid controlled steel tank rectifiers for other rolling mills include two 2,500 kW equipments for a rod and bar mill in India. Steel tank rectifiers for other purposes include two 7,500 A, 850 V sets for an electrochemical factory in the U.S.A., and two 2,500 kW equipments for London Transport Executive. Orders for steel tank mercury-arc rectifiers received from British Railways included 448 single-anode tank excitrons, to be mounted on the 112 motor-coaches for the Tilbury-Southend line. Germanium rectifiers are now in large-scale production and a number of equipments were commissioned during the year.

Most of the orders placed by the National Coal Board with the Mining Division, comprise geared a.c. equipments, having orthodox manual control, with ground-mounted single or double drums. Six of the a.c. winders will, however, be fitted with manual supervisory closed-loop control. The r.m.s. ratings of these six equipments vary between 800 h.p. and 1,800 h.p. On some of the orders for the National Coal Board, in addition to providing the winder electrical and mechanical equipment as part of the contract, the company will also supply the main transformer, main switchgear, air compressor and ventilating fan equipment.

Typical orders for Canada covered the complete electrical parts for geared Ward-Leonard winders, one for 700 h.p. and another for 450 h.p., each with closed-loop control. The larger of these machines is a multi-level skip winder, arranged for push-button automatic control. Included among the orders for South Africa were a 3,000 h.p. twin motor geared a.c. winder and an 850 h.p. geared a.c. winder. Several winders were commissioned during the year, including the first tower-type multi-rope friction Ward-Leonard skip winder in Great Britain, this being the largest friction winder of any type in this country. The combined rating of the twin winder motors is 3,950 h.p. Among overseas commissionings were a twin motor 4,040 h.p. geared a.c. winder in South Africa, and a 1,425 h.p. geared a.c. winder in Southern Rhodesia.

Orders received last year by the Traction Department included a large number of 25 kV, 50 c/s traction equipments for four-car suburban trains for service between London and Southend, and for a number of a.c. electric locomotives. The largest single order placed, for 400 h.p. diesel-electric shunting locomotive equipments, was awarded to English Electric, and brings the total of these equipments supplied or on order to over 1,000. In the export field, a second repeat order was received from the South African Railways for 2,000 h.p. 3,000 V electric locomotives, and the Rhodesian and Malayan Railways placed further orders for diesel-electric locomotives.

There was increased activity during the year in the varied range of equipment handled by the Electrical Plant Department. Power station auxiliaries represented one of the largest sections of the department's activities. Though the number of new stations planned per annum in Britain is decreasing, their size is increasing and the size of auxiliary motors required to drive feed pumps, boiler fans, fuel mills, etc., is growing in proportion. As examples of this trend, English Electric is at present manufacturing two-pole slipring motors up to 6,200 h.p. for boiler feed pumps and two-speed squirrel-cage motors for draught fans up to 2,140/1,090 h.p.; the squirrel-cage gas blower motors for Hinkley Point are 7,100 h.p. The drive for the 8ft by 8ft wind tunnel at the Royal Aircraft Establishment, Bedford, was commissioned during the year. The tunnel is a closed air circuit type and is provided with a ten-stage axial compressor designed and built by the company to circulate the air at speeds up to Mach 2·7 and pressures up to four atmospheres.

The year 1957 saw an increase in the output of diesel and dual-fuel engines. Repeat orders for marine engines have been received, both for propulsion and for auxiliary generating duties. Twenty auxiliary 500 b.h.p. units are on order for one company. Among interesting overseas orders was one for ten "16SV" 1,100 kW diesel generating sets which will be used for supplying power on site during the construction of a large hydro-electric project at Glen Canyon, Utah. The Admiralty placed a contract with the company for the design and manufacture of the main propelling steam turbines and condensers for the first British nuclear powered submarine. Amongst other orders are the complete auxiliary diesel alternator sets, switchgear and auxiliary motors for five 10,000 ton ships being built by Harland & Wolff, Govan, for the British India Steam Navigation Co.

Design and production of special motors included a nitrogen-purged 25 h.p. 75 r.p.m. 10 c/s stainless steel induction motor, for direct mounting on to a pressure vessel in a nylon manufacturing plant.

Five "DEUCE" computers were commissioned during 1957. The standard "DEUCE" is now fitted with automatic instruction modification and can also be supplied with 64-column "read and punch" facilities instead of the 32-column system.

Wind Tunnel Drives

I.E.E. DISCUSSION ON FOUR PAPERS

THE discussion on four papers on drives and methods of control of large wind tunnels presented before the Institution of Electrical Engineers on 9th January and reported in our last issue was opened by Mr. P. T. Fletcher (U.K.A.E.A.). The need for high-speed flight for both civil and military purposes, he said, showed that the authors' plant and others which would follow from it would have a future. His experience was that some of the technology involved was having an application in the nuclear power industry. In the United States, for high subsonic and near trans-sonic tunnels, the trend had been for the use of an induction motor for the main power component of the drive, coupled to a Ward-Leonard unit for starting and speed control, while for supersonic tunnels large induction motors had been used of about 30,000 shaft h.p. with speed control through rotor current regulation. Their practice for subsonic and supersonic work had subsequently moved towards very big synchronous and induction motors coupled in groups.

Mr. A. Asbury (English Electric Co.) pointed out that wind tunnels of the kind in question represented an enormous capital cost, so that their full utilisation was of great importance. If the information obtained from the measuring instruments was in such a form that it could be put immediately into a computer, an assessment of the result of the experiment could be made while the experiment was progressing, and the aerodynamicists could decide whether the range of parameters used was adequate while the model was still in the tunnel.

Mr. F. M. Scholes (R.A.E., Bedford), referring to the adjustment of the flexible wall, said it was interesting to look back now, after six years, and consider whether if they were starting again they would do things in the same way. A discrimination of 1 in 16,000 was necessary, so that a digital technique rather than an analogue one seemed the right choice. Comparing a fully digital system with an incremental one, the former would need some means of storing 14 million bits of information, and the latter about four million, so that it would be hard to justify changing the system. Tape would continue to be used, probably with electronic reading methods. There was a general feeling that the present system was too slow, but a twofold increase in speed would be sufficient. Though the time might not be ripe for a fully digital system, it might not be far off. The use of linear coded scales, now being developed for use with machine tools, might justify a fully digital system.

Mr. J. McTaggart (B.T.H.) referred to the three methods of analysis used in the paper on speed control, and estimated that the inverse Nyquist method might take two hours and the solution of the equations method four hours, whereas with the analogue computer an answer could be recorded in eight minutes.

Mr. W. H. P. Leslie (D.S.I.R.) asked why an analogue approach had been used for speed control but a digital approach for wall setting. Replying to this point later, Mr. Mallalieu pointed out that the problems and the specified operating conditions were different. For speed control there was need for smooth, continuous control over a wide range, operative during the time that readings on the model were being taken, whereas with the wall setting control what was wanted was knowledge of the position of the walls, but that position, once established, was at rest during the observation period.

Mr. J. M. Ferguson, referring to the paper on a power installation for large wind tunnel drives, agreed that when the drive was designed there had been very little information on the breaking capacity of circuit-breakers for anything other than standard frequencies, but said that since the paper was written further tests had been made, down to 25 and 10 c/s, which indicated that the American levels which had been assumed were very conservative.

Mr. J. J. Thomson suggested that a geared steam turbine with low-water-content boilers would have been the best solution. Boilers of the Velox type, for example, would occupy considerably less space than the existing installation and make it possible to do away with the "vast cathedral" which housed the gas turbine installation. With steam turbine drives it was easy to get the order of speed control which the authors required, 0·1 per cent.

All the authors replied. Mr. E. G. Mallalieu remarked that when Mr. Fletcher described American practice his own thoughts had turned to the U.S.S.R., and he wondered what wind tunnel facilities existed there for use in the development of their civil air liners and sputniks. In view of American developments, our own 8ft tunnel might seem to them just "an air on a shoestring." The answer to Mr. Thomson's point lay in the flexibility of an a.c. transmission system, which ultimately would prove cheaper and more flexible than any alternative. The "vast cathedral" was in fact a very small building compared to that required for a steam installation.

The Future Path

A SERIES of pamphlets on Britain in the second half of the century is being sponsored by the Federal Educational and Research Trust, 20, Buckingham Street, London, W.C.2. They are being written by men and women distinguished in international affairs and copies of the first two have been received. One, by Sir Cecil Weir, entitled "The First Step in European Integration," deals with the European Coal and Steel Community. Particular attention is paid to the United Kingdom's relationships with the Community and the hope is expressed that this country will eventually become more closely associated with it.

In the other pamphlet—"Europe, the Next Steps"—Paul Bareau recounts the negotiations between the six "Messina" countries which led up to the establishment of a European Common Market and the proposals for a European Free Trade Area. The problems attaching to the latter are discussed and the conclusion is that the Government was right in its decision to support the development although it might have made fewer reservations. The pamphlets are priced at 1s 6d each.

Diesel Maintenance

FUNCTIONAL breakdowns of items requiring routine maintenance in diesel engines provided the subject of a symposium held by the Diesel Engineers' and Users' Association on 16th January. Discussion was focused on the fuel system and on induction and exhaust systems.

NEW ELECTRICAL EQUIPMENT

Small Soldering Iron

A lightweight soldering iron, model 92, has been developed by WOLF ELECTRIC TOOLS, LTD., Pioneer Works, Hanger Lane, London, W.5, to meet

Wolf model 92 lightweight soldering iron

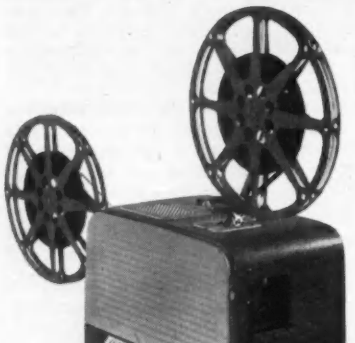
the requirements of continuous small assembly and instrument work in the radio and electronic industries. A 25 W flat wound element is employed and the dull, nickel plated copper bit is designed for easy replacement. A split moulded handle is used with all terminals easily accessible. Slots are provided in the chromium plated barrel of the iron to ensure that the temperature of the handle is maintained within comfortable limits. It is available in a standard range of voltages from 25 and 50 to 225/250 and the weight is 3 oz. The price is £1 2s 6d.

Film Projector

A new G.B.-Bell & Howell magnetic/optical 16 mm film projector (Model 640) made by RANK PRECISION INDUSTRIES, LTD., 37-41, Mortimer Street, London, W.1, enables high-quality sound films to be produced quickly and cheaply in any tongue, complete with sound effects. The commentary can be changed without disturbing the background noises. This is done by recording the background noises direct from the optical sound track on to the magnetic track and adding the commentary.

For greater reliability, the amplifier utilises a printed circuit construction. It has the exceptional sound output of 16-18 W and separate volume controls for magnetic and optical sound tracks permit the reproduction of the tracks either independently or simultaneously. A disc input allows dialogue and music to be mixed and recorded in any desired combination.

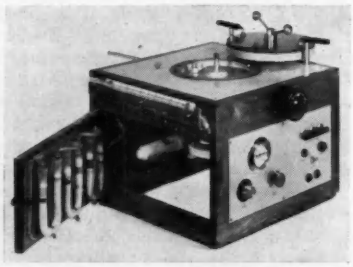
Two interchangeable magnetic heads are available, one for full and half striped tracks, the other for edge stripe. A variable aperture plate makes possible projection at any picture ratio from 1·34 : 1 (standard film) to 1·85 : 1 (wide screen and VistaVision). The projector weighs 37 lb 6 oz. Its dimensions are 16¾ by 13½ by 10⅛in.



G.B.-Bell & Howell model 640 projector

Precision Vacuum Oven

A new vacuum drying oven for precise determination of loss of weight on heating is being produced by



Gardiner precision vacuum oven

GRIFFIN & GEORGE, LTD., Ealing Road, Alperton, Wembley, Middlesex.

The Gardiner precision vacuum oven is of circular plan and has uniform temperature distribution. The cadmium-plated mild steel heating block, 9in in diameter, is heated by 12 refractory heating elements inserted radially and controlled by a thermostat adjustable up to 110 deg C. There is accommodation in the block for six shallow 2in diameter sample dishes. Around the block perimeter are six air entry ports, connected to a tubular distribution ring. The air passes out through exit ducts in the lid into a desiccator which is screwed into the underside of the heating block. An air bleed drying train reduces the water content of the air supplied to the test chamber to 0·0007 mg per litre. The air flow to the chamber can be controlled and measured.

Resistance Welder

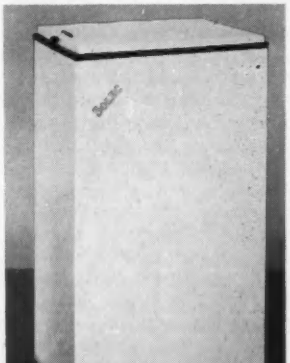
Primarily designed for research work into either spot, seam, roll spot or projection welding, a new resistance welder recently produced by SCIAKY ELECTRIC WELDING MACHINES, LTD., Falmouth Road, Slough, can be used for production runs if necessary. To make the machine suitable for practically every kind of metal, the pressure head is pneumatically controlled and provision made for one, two or three pressure cycles. A frictionless roller bearing diaphragm head is fitted.

The fully electronic Sciaky control panel allows for extremely accurate timing control from ½ cycle upwards, phase shift stepless heat control, slope control and preheat and/or post-heat. Three fully synchronous basic Sciaky dekatron timers plus motor control give an almost infinite combination of machine settings. The main frame of the machine is fabricated from heavy gauge steel plate designed to withstand any stresses likely to be imposed.

Heavy duty spot, projection, seam or roll spot welding may be done on the machine. Two lower arms are supported on pillars, one on each side of the machine. The seam or roll spot arm, when clamped into position, engages with a shaft from the infinitely variable speed motor/brake unit. For spot welding, the tee-slot platen equipped lower arm is used in conjunction with bolted-on electrode holders. The arm not in use may be swung through approximately 180 deg to lie along the machine's main frame.

Drying Cabinet

The introduction of a new clothes drying cabinet, the "Solec," is announced by H. N. SOUTHERN (ENGINEERS), LTD., Church Lane, West Bromwich. The heating unit consists of three totally enclosed elements supported in heat resisting refractories. The element casings are of welded silica tube, ensuring safety from corrosion or earthing by the water or condensed steam created during the drying process. Each element is rated at 400 W and three heats are obtainable by means of two switches, full heat (1,200 W), medium (800 W) and low (400 W). The cabinet is constructed of "Bonderized" steel and finished in cream or white stoved enamel. It is easily manœuvrable, being mounted on ball bearing castors. The price is £12 10s which includes purchase tax in the United Kingdom.



"Solec" clothes drying cabinet (H. N. Southern (Engineers), Ltd.)

NEW SEASON'S REFRIGERATORS

THE 1958 range of domestic refrigerators announced by the Frigidaire Division of General Motors, Ltd., includes seven different free-standing models, six of which are available with a choice of right- or left-hand doors. The sizes range from the 3·2 cu ft model, introduced for the first time last year, to a de-luxe type refrigerator with a capacity of 11·1 cu ft. Almost all are available in the full range of Frigidaire colours—Mayfair pink, Sherwood green, snowy white, Cotswold cream and Olympic red—and some have contrasting table tops in cream and beige. Beige is also the overall interior colour, with shelving in pink plastic on steel.

The interior detail is claimed to be more comprehensive than before and includes freezer chests for frozen food storage; butter, egg and cheese compartments; interior lights; anodised shelf trims; and an adjustable cold control in each model which gives a choice of twelve settings including "de-frost" and "off." Brief details of the basic models are as follows:—

The MY-32 model has a capacity of 3·2 cu ft and, measuring only 21in square by 36in high, is suitable for the smallest kitchen. It is fitted with door shelves and an egg rack, and also contains a freezer to hold 7 lb of frozen foods, etc. The price is £47 11s 8d plus £20 13s 4d purchase tax in the United Kingdom. It is also available as a built-in model.

Frigidaire models MY-45 and (right) MY-94

An interior light and a new-style door with raised relief are special features of the MY-45 4·5 cu ft refrigerator. It has a 12 lb freezer and as with the MY-32 it is also available for "building-in." The price is £56 5s plus £24 12s tax.

The DY-45 is a 4·5 cu ft de-luxe model with a newly styled door and kick-plate. An interior light, butter compartment, full width "hydrator," ice tray and a 12 lb capacity freezer are among its refinements. It is also available as a built-in model and with left- or right-hand door. The price is £61 6s 2d plus £26 17s 10d tax.

With 16·2 sq ft of shelf area and a vertical freezer (19½ lb capacity), the MY-94 9·4 cu ft model also possesses a handy door store consisting of four door shelves as well as two egg racks and a butter and cheese compartment. The price is £103 16s 8d plus £45 5s 4d tax.

About 40 lb of frozen produce can be stored in the freezer of the DY-94 9·4 cu ft de-luxe refrigerator. Two "roll-to-you" baskets and three egg compartments are additional features of this model, the price of which is £115 7s 11d plus £50 10s 1d tax.

The largest model, the MY-111, has a capacity of 11·1 cu ft and contains two "roll-to-you" type shelves, three full-width interior shelves, five door shelves and four storage compartments. A vertical freezer holds up to 27 lb of frozen foods and the refrigerator costs £130 11s 4d plus £57 7s 8d tax.

The DY-111 de-luxe model is similar in many respects to the previous refrigerator but this has an insulated super-freezer chest for the storage of 40 lb of frozen foods. The shelf area is 17·8 sq ft and the price is £142 2s 6d plus £62 12s 6d tax.

All the foregoing refrigerators are operated by the Frigidaire "Meter-Miser" rotary compressor, which is warranted for five years.

Electrolux Models

Five refrigerators ranging from 3¾ to 14 sq ft of shelf area in size constitute the 1958 Electrolux range. All of these are of the absorption type. Of the five, two are new (models L.37 and L.76), while the L.24, although originally scheduled for this year, was first marketed four months ago.

The L.37 has a shelf area of 7¼ sq ft and is attractively coloured in cream or white with ice blue and gold trims. Its features include a frozen food storage compartment; a cold tray for uncooked meat or fish; four internal shelves; a full-width vegetable drawer; three adjustable door shelves; and, also incorporated in the door, a butter and cheese compartment. The steel interior cabinet is lined with white porcelain enamel and the price is £51 16s 4d plus £22 14s 8d tax.

The other new model, the L.76, has over 14 sq ft of shelf area and is the

Electrolux L.37 (top), L.24 (centre) and L.76 (below)

largest of the range. It is styled in white or cream with porcelain enamelled interior trimmed in ice blue and gold. Its frozen food compartment will accommodate up to 16 averaged sized frozen food packets and another feature is its draw-out shelf which enables food to be taken from the back without having to rearrange the loading. There are two vegetable drawers and the door is provided with an egg shelf, covered butter and cheese compartment and four adjustable shelves. There is also an interior light. The price is £106 11s plus £46 15s tax.

The model 24, with a shelf area of 5 sq ft, also has an attractive door-shelf arrangement, including an egg rack. It is finished in either white or cream with a decoration in ice blue. The interior is lined in white porcelain enamel. The price of this refrigerator is £43 15s 9d plus £19 4s 3d tax.

Another popular model is the L.500, which is retained for another year. This has a shelf area of 9¼ sq ft and is provided with an interior light. The price is £81 14s 9d plus £35 17s 3d tax.

The fifth refrigerator in the Electrolux range is the built-in model M.170 which is now available to the general public. It has 3¾ sq ft of shelf area and it can be supplied with either a left- or right-hand door. The price of the refrigerator is £37 4s 5d plus £16 6s 7d purchase tax.

The company has also produced an attractive tray-top which is available for use with models L.37, L.24 and the earlier model L.230. It is edged in white or cream to match the cabinet with the centre in heat resisting "Hardec," in a choice of blue or red. This tray-top can be purchased separately, price £1 17s 10d plus 4s 2d purchase tax.

FLUORESCENT FITTINGS

AN entirely new range of contemporary styled industrial, commercial and decorative fluorescent fittings is now being marketed by the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2. Known as the "101" range, the new design, which has been evolved as the result of a nation-wide survey of customer requirements, incorporates new reflectors, diffusers, holders and fluorescent tubes.

The range is based on a rigid, precision-made channel to which assemblies are attached and as the designs avoid the use of a multitude of small parts maintenance is kept to the minimum. In order to achieve standardisation, new tube holders have been designed for use throughout the range and all tubes up to 5ft are fitted with bi-pin caps. Recessed double-contact (r.d.c.) caps are fitted to the 8ft tubes.

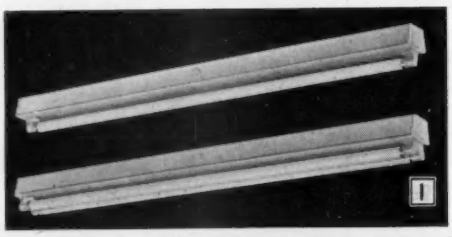
Both the single and twin types of holders have identical means of fixing, and use of the retracting principle allows even the longer tubes to be fitted and removed from one ladder position. The dimensions of the holders have been kept to the minimum so that they present a neat appearance when visible, and the new design also reduces the darkening appearance of enclosed fittings which is said to be apparent when b.c. holders are used.

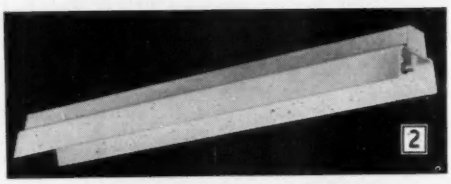
The basic channel for the fittings is of steel with die-cast ends. It is pre-treated for resistance to rust and the finish is in white stoved enamel. For situations in which corrosive conditions may exist an alternative finish can be supplied. The 8ft patterns are fitted with retractable holders at each end, but other sizes make use of one retractable and one fixed holder. G.E.C. control gear is used throughout the range. Switchless or switch circuits are available with the 3, 4, 5 and 8ft units, but the 1½ and 2ft sizes are for switch circuit only. The control gear is fixed on to the back plate and internal wiring is secured by insulated cleats. A fused mains terminal block is provided for incoming cables.

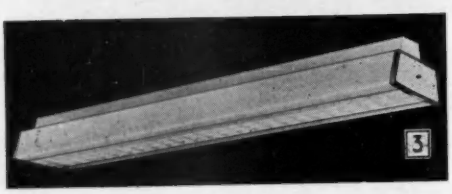
The channel is equipped with various means of fixing. A series of ¼in knock-outs is provided for use with either conduit suspensions, or hooks attached to chains, or the channel can be screwed direct to the ceiling by using washers which fit into any of the knockouts. For installations where adjustable or non-standard centres are required the unit has a continuous rail arrangement which is designed to engage with sliding hangers. These hangers can be purchased separately.

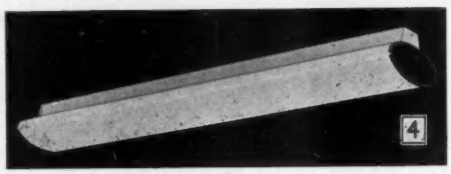
A new under-access lighting trunking system has been specially designed for large industrial installations. The method of attaching reflectors is identical with that for the "101" range of lighting fittings, enabling standard "101" reflectors to be used. The trunking can either be suspended from sliding hangers or direct ceiling mounted. The finish is in "duck egg" blue with white cover plates and reflectors, but if required other standard colours can be supplied for orders exceeding a total length of 500ft.

The new range can be attached in any position along G.E.C. cable trunking which consists of 2in square ducts, available as units of one, two or three compartments. The ducts can either be recessed into the ceiling, surface mounted or suspended. An alternative method comprises a single-way suspension duct fitted with 13 A socket outlets. Integrated with the underside of the duct is a continuous rail from which the fittings can be suspended by means of sliding hooks. By wiring each fitting with a short t.r.s. tail terminating in a 13 A fused plug the whole unit can be erected by the simple process of hanging it on the rail and plugging it into a socket.









1. The basic channel of the G.E.C. "101" fitting is shown provided with single and twin holders. 2. An open ended "Perspex" reflector fitting. 3. A louvred diffuser fitting which comprises a standard channel and an enclosure with sides of reeded "Perspex" and white louvre. 4. A full reeded "Perspex" diffuser fitting with black ends and polished brass trim

Transformer Oil Breakdown

DISCUSSION ON I.E.E. PAPER

THE discussion of the paper by Dr. R. Hancox and Dr. H. Tropper on the breakdown of transformer oil under impulse voltages, which was given at the Institution of Electrical Engineers and abstracted in our last issue, was opened by Dr. J. B. Higham (Pilkington Bros.). The speaker referred to differences between the results obtained at Queen Mary College and those obtained by himself and his colleagues at Birmingham University in apparently similar crucial experiments concerning the theory of breakdown. He agreed with the authors' three main conclusions but disagreed with the theory that the principal role of the bubble was to produce direct increase of electron emission from the cathode and with the suggestion that bubbles were responsible for the conditioning process. He had already put forward a different theory, which appeared to indicate that when the work of the Birmingham group was published there might be a rewarding investigation into the points of difference; it might yield useful clues to the breakdown mechanism.

Mr. E. T. Norris (Ferranti), chairman of E.R.A., said that what the authors called transformer oil bore little resemblance to the substance inside most transformers and circuit-breakers in service. Chemically pure oil tested under laboratory conditions would show incredible strengths of 10,000 kV/in. The authors were measuring the electric strength not of transformer oil but of the impurities in it.

Mr. C. G. Garton (E.R.A.) referred to the difficulty of maintaining microscopic bubbles within a liquid because of the surface-tension forces, which caused a quick solution of the bubble. If bubbles existed in spite of these forces, why was not the increased electron emission by means of the bubble obscured by the effect of metallic irregularities on the surface? Moreover, he doubted whether bubbles could be completely abolished, as the authors suggested, by a change in vacuum technique from 20 mm to 5 mm Hg absolute. It was possibly significant that this range was the range where water might or might not evaporate in a vacuum, depending on how well the vacuum system dealt with water vapour as distinct from gas.

Field Configuration

Dr. L. L. Alston (A. Reyrolle & Co.) said the authors had stressed the importance of the test technique in determining the electric strength of oil. Comparison of results of recent researches showed that in non-uniform fields there were about as many field configurations as there were investigators. He wondered whether there could be preferred field configurations of the types the authors had been using.

Mr. H. K. Beale (N.P.L.) said that work which he had done was in general agreement with Dr. Higham's conclusions on the conditioning effect rather than with the results reported in the paper.

Mr. F. S. Edwards (Metropolitan-Vickers) was not altogether convinced by the paragraph in which the possibility of ionisation of the bubbles was dismissed almost peremptorily. Had the authors considered the use of other gases than air so that if there were any residual gas it would not be air? They could choose gases with different properties and discover whether the residual gas affected the results. They might also consider providing some irradiation inside the electrode.

Mr. E. G. Wright (Ottermill Switchgear) said that even though the authors obtained high values it was unlikely that advantage could be taken of them in practical design. There was not much hope in practice of carrying out the filtering, degassing and refining shown in the paper. In dealing with the conditioning effect the authors showed that the first breakdown was appreciably lower than later breakdowns, but for design purposes the first surge which broke down the equipment was not conditioning the equipment; it was a breakdown and a failure. The first breakdown values were the figures of main interest.

Mr. R. E. Wootton (B.I.C. Cables) said that they were interested in the effect on impulse strength of the presence of gas in oil-paper dielectrics during testing. They had constructed a small test cell for observing what occurred in such cases.

Mr. J. K. Webb (Standard Research Telecommunication Laboratories) inquired how the authors' work would enable him to pick out the best insulants for impregnating paper dielectrics?

E.R.A. Reports

THE overall accuracy of a network analyser depends on the combined influence of errors from many different causes. It is therefore virtually impossible to estimate their combined effect without making a large number of measurements. A simple problem was submitted by the Central Electricity Authority with the object of ascertaining whether the results could be obtained from the E.R.A. analyser with sufficient accuracy more quickly than by direct calculation.

Since the problem is of such a nature that small inaccuracies in the analyser can lead to large errors in the result and since its solution requires a large number of readings for which calculated values are available, it provides an excellent opportunity for investigating the influence of the various sources of error in a network analyser. A recent publication issued by the British Electrical and Allied Industries Research Association, Ref. V/T131, "A Network Analyser Test Problem," by P. G. Kendall (7s 6d), describes the use of the problem to assess the accuracy of the E.R.A. analyser.

Insulation Strength

It is common practice in many branches of electrical engineering to build up insulation on conductors by means of a spirally-wound strip of insulation as in the case of busbars, bushings, cables and transformer windings. The electrical properties of such laminated insulation may differ from those of bulk material and it is desirable therefore that these should be investigated. Ref. S/T79, "The Surge Electric Strength of Oil-Impregnated Paper Insulation," by G. W. Bowdler, M.Sc., National Physical Laboratory (12s 6d), is mainly concerned with the breakdown under surge voltages of the paper covering between pairs of copper conductors immersed in transformer oil after thorough drying and impregnation with transformer oil *in vacuo*.

GENERATION AND DEVELOPMENT

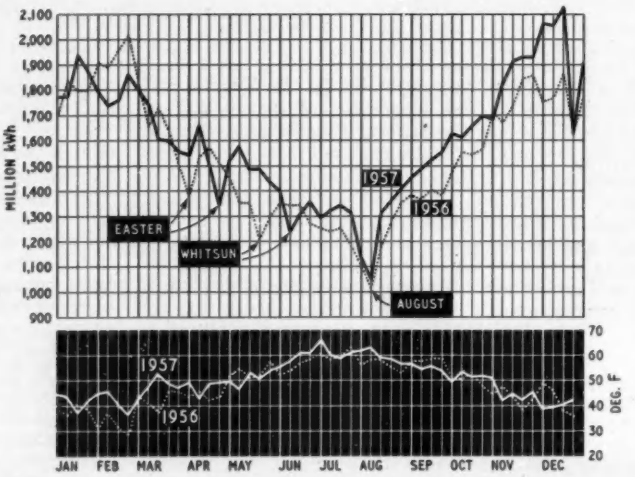
London Credit Sale Scheme

The London Electricity Board has decided to introduce credit sale facilities for a number of approved appliances with a cash price of £5 or more. This was reported at last week's meeting of the Area Consultative Council when it was stated that the terms provided for a service charge at the rate of 5 per cent of the cash price, the credit sale amount being payable in nine monthly instalments, the first at the time of purchase. The appliances covered included cookers, water heaters, wash boilers, washing machines, clothes dryers, drying cabinets, refrigerators, vacuum cleaners and floor polishers, as well as wiring installations ancillary to the sale of major appliances.

The chairman of the Consultative Council, Ald. I. J. Hayward, explained that the Board was one of the few which had not hitherto offered such facilities. The Gas Council, he believed, had always done so. Though the Board had stood out against credit sale schemes in the past, it felt it was losing business and so had decided to give the system a trial.

Output and Temperature

The accompanying graphs, based on the weekly statistical statements issued by the Ministry of Power, show the trends of electricity output and average temperatures during 1957.



Weekly electricity output of solid-fuel fired power stations and (below) average weekly temperatures

The output figures relate only to public supply steam stations, which last year sent out 82,967 million kWh against 79,689 million in 1956, an increase of 3,268 million kWh (4·1 per cent).

Temperatures last year were generally higher than in the preceding twelve months, the average being 50·2 deg F as compared with 48·1 deg F. The Ministry's statement shows that for the 30 years 1921-50 the average was 49·4 deg F.

Coal consumption by the electricity industry in the 52 weeks to 28th December amounted to 46·5 million tons, against 45·6 million tons in the corresponding period of 1956. At the close of the year distributed stocks at power stations totalled 7·7 million

A recent view of the Berkeley nuclear power station which is being constructed by the A.E.I. John Thompson Nuclear Energy Co., Ltd., for the Central Electricity Generating Board. Work has now been in progress at the site for just a year and the first plates of the second reactor's steel vessel are being assembled for welding

tons, representing 7·1 winter weeks' consumption; these figures compare with 6·9 million tons and 6·5 weeks' consumption a year ago.

New Hereford Grid Substation

Herefordshire's first 132 kV grid substation, to meet the rapidly rising demand for power in the county, was officially opened by the chairman of the Midlands Electricity Board, Mr. W. S. Lewis, at Mordiford, near Hereford, on 14th January. The grid substation has been built at a cost of about £450,000 by the Midlands Division of the Central Electricity Authority—now the Central Electricity Generating Board—in co-operation with the M.E.B., which has built a 66 kV distribution substation on the same site at a cost of £77,000 through which the supplies will be fed to all parts of Herefordshire.

Eastern Topics

It was reported at last Friday's meeting of the Eastern Electricity Consultative Council that the provision of the Cheques Act, 1957, were estimated to result in savings to the Board of the order of £20,000 a year.

Presenting the report of the General Purposes Committee meeting held the same morning, the chairman, Alderman W. J. Bennett, said they had been privileged to have present the Minister of Power, Lord Mills. It was the first occasion on which he had been able to see a Consultative Council set up under his ministry in operation. Among the matters dealt with was a representation from the Essex County Council who were alarmed at the large number of overhead lines being erected in the county. The Committee felt that while overhead lines might be necessary in the present stage of development, as a long-term policy the Board should be asked to consider putting some of the lines underground.

Consultative Council Regulations

The Minister of Power has made the Electricity (Consultative Council) (Areas) (Amendment) Regulations, 1958 (S.I. 1958: No. 1) (H.M. Stationery Office, price 3d). These Regulations amend those made in 1948 regulating the chairmanship, terms of membership and proceedings of Electricity Consultative Councils, as specified in Part I of the First Schedule to the Electricity Act, 1957.

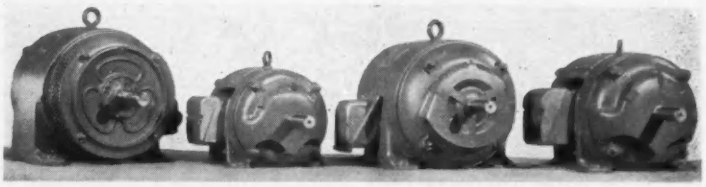
Supply Standardised in South Scotland

The last d.c. consumers in the South of Scotland Electricity Board's Area have now been changed over to a.c. and all non-standard a.c. voltages have been eliminated. Announcing this the Board says that since 1st April, 1948, 36 650 d.c. consumers in the South of Scotland have been changed over. The cost incurred by the Board in converting consumers' apparatus for a.c. use has amounted to over £1½ million and a similar amount has been spent on the replacement and reinforcement of plant and cables to make the system suitable for a.c. distribution. The work was carried out without charge to the consumers.

The voltages of supplies are now standardised at 240 V for lighting and domestic use and at 415 V (three-phase) for small power use. Since 1st April, 1948, over 365,000 consumers in South Scotland have been transferred from non-standard to standard a.c. supplies.

The Board is the first in Britain to have a distribution system supplied entirely by a.c. at a uniform voltage.

DRIP-PROOF MOTORS

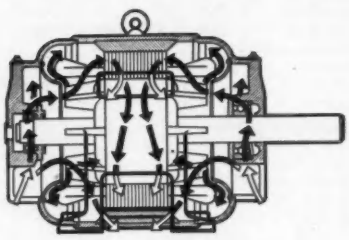


Comparison of old and new sizes; all are 7½ h.p. On the extreme left is the Brook "R" type motor, the standard product for many years; next is the new "C" type motor. The two motors on the right are the old and new N.E.M.A. frame motors

A NEW range of drip-proof motors designed to comply with the Draft Specification CW (ELE) 6426 for dimensions and to the amended B.S. 2613 for electrical performance with Class "E" insulation is announced by Brook Motors, Ltd., Empress Works, Huddersfield. This type "C" range covers motors from ½ to 50 h.p. The use of new insulating materials, with improved ventilation and compact design, means that a motor of, say, three-quarters the present size will do the same work.

Particular care has been given to the design of the ventilation system. The cooling air stream is drawn into the ends of the motor, guided by pressed steel air deflectors, which also serve as additional protection for the end windings, and after passing over the windings is expelled through openings in the yoke casting.

The former B.S. 168 permitted a maximum temperature rise of 40 deg C, which allowed for sustained overloads. The newly amended B.S. 2613, for electrical performance, permits a maximum temperature rise of 65 deg C under continuous maximum rating conditions.



The cooling air-stream is drawn in at the ends of the motor and after passing over the windings is expelled through the side openings in the yoke casing

Brook Motors have made exhaustive tests on the prototypes of their new Class "E" machines and have succeeded in obtaining better starting performance and remarkably cool running, well below the limits imposed with full output. In many instances, tests show a temperature rise close to the previous standard, and the motor will exceed in performance all previous ventilated machines of equal rating.

The terminal box is cast iron with additional space for connecting power cables to the plastic moulded terminal board. The box can be rotated to four positions as also can the end-shields, making a mounting on floor, wall or ceiling a simple matter while retaining the full protection of the drip-proof design. Shafts are of 40 tons tensile steel, rotors have integrally cast fans and the whole shaft assembly is dynamically balanced on electronic machines to give quiet running on pre-loaded medium ball bearings.

These motors are compact, easy to fit in confined spaces, lower in weight-for-size ratio with resultant lower freight costs and, most important, lower in first cost due to great savings in basic materials. A range of motors similar in appearance except for smaller diameter shaft extension is being produced to the N.E.M.A. (American) re-rate specification. These motors have Class "A" insulation and are made for use on 60 c/s supply. They are already being sold in the United States through Brook Motors' own subsidiary company in Chicago and their agents in Canada. As service and spares facilities exist in centres all over the North American Continent these motors can be fitted to any machines for dispatch to the Americas.

Financial Section

STOCKS and SHARES

NEW issues have been providing the main points of interest in the Stock Exchange. In the gilt-edged market the news of a £500 million issue of Government stock had a satisfactory reception, and the firm trend of prices was maintained after faltering only slightly over the changes at the Treasury. Of industrial issues, the new Richardsons Westgarth convertible loan—the first of its kind to be offered by way of "rights"—acquired quick popularity after the beginning of dealings. Quiet market conditions await the Babcock & Wilcox "rights" offer of 1·88 million new ordinary shares at 20s: the allotment letters are due to go out next Wednesday and dealings may be expected the following day.

Price Changes

Although the majority of the price changes recorded in the electrical market have been towards the lower side, few have been of any particular significance. Crompton Parkinson shares have lost ground since the scrip issue, which seems to have led to some selling of the new shares. At 9s, the price has declined by 1s over the past fortnight, bringing the prospective yield to nearly 6 per cent. Duport, which have also been the subject of a scrip issue, turned easier, and some cable shares remained dull as a result of the continued weakness of copper prices: in this group Henley's, Hackbridge Holdings and Johnson & Phillips all fell below the lowest of last year's quotations. Among the shares to gain ground on the week were Automatic Telephone, Ward & Goldstone and Crabtree Electrical.

Richardsons Westgarth

Dealings began last week in Richardsons Westgarth's new convertible loan stock, of which £3¼ million is being issued, the greater part of it to the company's stockholders by way of rights, at a price of 99. The stock carries a fixed 6 per cent rate of interest, payable until redemption by 1976–81, while the conversion rights give holders the option of exchanging each £25 stock for 31 of the company's ordinary shares in 1961, for 30 shares in 1962, or for 28 shares in 1963. Early transactions took place at a premium of over 3 points. To a buyer at an all-in price of 102, the current yield is a fraction under 6 per cent, and the conversion terms give him in effect an option on the ordinary shares at prices ranging from approximately 16s 6d to 18s 3d between 1961–2, as compared with their present market price of 13s 9d. They are quoted now in 10s units, the denomination having been altered from 5s to give effect to the 100 per cent scrip issue.

Capital Plans

At the extraordinary meeting of Richardsons Westgarth held in connection with the increase of capital, Mr. O. J. Philipson took the opportunity to give shareholders some general comments on the group's affairs. Regarding the capitalisation issue, he explained that the doubling of the issued ordinary capital would help to

Price Changes in

Company or Board	Nom. Value	Middle price 13th Jan.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	72½		3	3	4 2 9	80	70
Brit. Elec. 1974/77	100	69½	+1	3	3	4 6 3	78½	66
Brit. Elec. 1976/79	100	72½		3½	3½	5 16 6	81½	70
Brit. Elec. 1974/79	100	84	+½	4½	4½	5 1 3	92½	79½
Overseas Electric Supply								
Calcutta Elec.	£1	16/9		6†	6·8†	8 2 0†	19/-	15/-
East African Power	£1	19/-		7	7½	7 18 0	21/-	19/-
Nigerian Elec.	£1	16/6		10	10	12 2 6	18/6	16/6
Perak Hydro-Elec.	£1	15/6		10	12½	16 2 6	18/-	13/3
Electrical Shares								
Aberdare Cables	5/-	10/6		17½	17½	8 6 9	12/-	9/9
Aerialite	1/-	6/-		48	51½	8 11 9	6/9	4/9
Allen, W. H.	£1	35/-		10	10	5 14 3	47/3	33/6
Anglo-Portuguese Tel.	£1	21/9		8	8	7 7 3	27/6	20/6
Aron Elec. Ord.	£1	55/-		15	15	5 9 0	60/-	53/6
Assoc. Elec. Ord.	£1	48/9		15	15	6 3 0	73/-	48/9
Automatic Tel. & El.	£1	60/-	+2/6	15	17	5 13 3	75/-	54/6
Babcock & Wilcox	£1	52/6		15	15	—	82/6	54/9
Bakelite	10/-	20/-		16	15	7 10 0	24/6	20/9
Baldwin, H. J.	2/-	3/9		20	20	10 13 3	5/-	3/9
Berry's Electric	5/-	6/-		—	10	8 6 9	6/6	5/6
British Aluminium	£1	42/-	+3d	12	12	5 14 3	71/3	38/9
Brit. Elec. Traction:								
Def. Ord. "A"	5/-	20/-		22½	25	6 5 0	25/-	17/-
B.I. Callender's	£1	39/9		12½	12½	6 5 9	55/-	39/6
B.I. Callender's 6% Pref. ...	£1	20/-		6	6	6 0 0	21/9	19/-
British Tabulating	£1	40/3	−1/-	9	10	4 19 6	56/3	37/6
British Thermostat	5/-	21/3		25	25	5 17 9	27/6	21/3
British Vac. Cleaner	5/-	5/-		15	10	10 0 0	8/-	5/-
Brook Motors	10/-	33/9		25	25	7 8 3	37/6	30/-
Bulgin, A. F.	1/-	4/9		50	40*	8 8 6	5/6	4/-
Burco Dean	5/-	14/3		20	22½	7 17 9	14/-	8/9
Cable & Wireless:								
Ord.	5/-	9/6		10	10	5 5 3	12/6	9/6
4% Loan	100	91½		4	4	4 7 6	92½	89
Chloride El. Storage "A" ...	£1	57/-	−6d	17½	17½	6 2 9	68/9	55/9
Clarke Chapman	£1	135/-		22½	27½	4 1 6	9	5½
Cole, E. K....	5/-	17/3		17½	17½	5 1 6	23/6	16/6
Cossor, A. C.	5/-	5/-		Nil	2½	2 10 0	7/3	5/-
Crabtree	10/-	24/9	+6d	20	20	8 1 6	26/-	23/3
Crompton Parkinson Ord. ...	5/-	9/-	−6d	16	16	5 18 6*	11/9	9/3
De La Rue	5/-	21/9	+6d	30	35	8 1 0	24/9	16/3
Decca "A"	4/-	25/-		43¾	43¾	7 0 0	32/3	22/-
Desoutter	5/-	15/6		30	32½	5 4 9*	17/9	13/9
Dewhurst	2/-	7/6		16½	20	5 6 9	7/9	5/9
Dictograph Tel.	2/-	5/3		20	20*	7 12 6	6/3	5/3
Dubilier Condenser	1/-	3/3		30	30	—	5/3	3/-
Duport	5/-	9/-	−3d	25	25	6 19 0*	10/6	8/6
E.M.I.	10/-	28/9	−9d	15	15	5 4 3	36/-	23/9
Electrical Components	5/-	7/6		25	12½*	8 6 9	8/-	6/6
Elec. Construction	£1	22/6		8½	8½	7 11 0	27/6	21/9
Elliott-Automation	5/-	12/-		—	10‡	4 3 3	12/6	10/3
Enfield Cable Ord.	£1	12/9		Nil	Nil	Nil	21/6	12/3
English Electric	£1	47/-		12½	14	5 19 3	65/-	47/6
English Electric 3½% Pref. ...	£1	12/3		3½	3½	6 2 6	14/3	11/3
Ericcson Tel.	5/-	18/6	−1/-	20†	22†	2 19 6*†	25/-	17/-
Ever Ready	5/-	14/6	−3d	35	37½	6 9 3*	20/-	14/-
Falk Stadelmann	£1	36/3		17½	17½	9 13 0	40/6	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

show more accurately the size of the resources permanently invested in the group's undertakings. He connected the loan stock issue with projected expenditure in the region of £6 million, over the next four years, on new development, renewals, etc., and pointed out that the three periods between 1961–63, during which holders had the option of converting the stock into ordinary shares, covered time enough for the capital expenditure to become profit-earning. He predicted worthwhile results for the group's major plans, in the absence of serious deterioration in general trade conditions or in industrial relations.

Electrical Investments

Company or Board	Nom. Value	Middle price 13th Jan.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Electrical Shares—continued						£ s d		
G.E.C. Ord.	£1	37/6	−1/3	14	12½	6 13 3	58/9	37/6
G.E.C. 6½% Pref.	£1	20/6		6½	6½	6 6 9	23/6	19/6
General Cables	5/-	11/6		30	24	10 8 9	15/6	11/6
Greenwood & Batley	£1	47/6		17½	17½	7 7 3	51/3	45/3
Hackbridge Holdings	5/-	10/3	−6d	30	30	9 15 0	21/9	11/3
Hackbridge & Hewittic	5/-	11/3		23	20	8 17 9	16/-	10/-
Head Wrightson	5/-	18/9		20	22½	—	24/3	16/6
Heatrae	2/-	4/9		15	15	6 6 6	4/9	4/-
Henley's	10/-	10/9	−3d	11½	11½	10 14 0	17/-	11/-
Holophane	5/-	13/-		30	37½	8 13 0*	15/9	10/3
Hoover	5/-	32/-	−6d	50	50	7 16 3	44/-	24/9
I.C.I.	£1	38/-	−1/6	10	10	5 5 3	46/6	36/3
Intl. Combustion	5/-	20/6		20	22½	5 9 9	30/-	19/3
Johnson & Phillips	£1	17/-	−1/-	15	10	11 15 3	34/6	18/9
Lancashire Dynamo	£1	32/6		11	11	6 15 3	45/9	33/6
Laurence, Scott	5/-	14/3		15	15	5 5 3	19/9	13/9
Lister, R. A.	£1	25/9		10	10	7 15 3	33/9	23/3
London Elec. Wire	£1	41/3		12½	12½	6 1 3	53/9	40/9
Lucas, J.	£1	28/-		7½	7½	5 7 3	36/6	27/6
Marconi Marine	£1	30/-		10	10	6 13 3	37/-	30/-
Marryat & Scott	2/-	10/6		30	35	6 13 3	13/-	8/-
Mather & Platt	£1	47/-		15	15	6 7 9	63/9	47/-
Metal Industries	£1	24/-	+9d	Nil	9	7 10 0	30/-	20/3
Midland Elec. Mfg.	£1	47/6		12½	12½	5 5 3	52/6	45/-
Morphy-Richards	4/-	15/-		50	20*	5 6 9	20/-	11/6
Murex	£1	56/9	−9d	20	20	7 1 0	79/6	58/3
Newman Ind.	2/-	2/9		10	10	7 5 6	2/11	2/1
Oldham & Son	1/-	2/6		17½	17½	7 0 0	3/-	2/3
Parnall (Yate)	5/-	6/9		12	12	8 17 9	8/9	5/9
Parsons, C. A.	£1	52/6		8½	7½*†	—	71/3	45/-
Plessey	10/-	60/-		30	30	5 0 0	86/3	60/-
Pye "A" Deferred	5/-	12/6		12½	12½	5 0 0	20/-	12/-
Reyrolle	£1	81/3		16½	17½	4 6 3	110/-	72/-
Rheostatic	4/-	7/9		18½	12½*	6 9 0	10/-	7/-
Richardsons Westgarth	10/-	13/9x.r.		16½	16½	6 1 3	20/-	13/6
Scottish Cables	4/-	13/3		27½	27½	8 6 0	19/3	13/3
Simon-Carves	5/-	25/-		28½	20*	4 0 0	36/3	23/9
Smith (England), S.	4/-	7/3	−3d	17½	20	5 10 6*	8/-	6/3
Southern Areas	£1	11/3		7½	7½	13 16 9	20/-	11/3
Strand Elec.	5/-	5/9		15	15	13 0 9	8/-	5/9
Sturtevant	5/-	17/9		15†	15†	4 4 6†	27/-	17/9
Sun Elec.	£1	47/6		25	25	10 10 6	47/6	42/-
Switchgear & Cowans	5/-	9/3		25	25	13 10 6	15/6	9/6
Taylor Tunnicliff	5/-	11/9		15	15	6 7 9	13/9	11/9
T.C.C.	10/-	37/6		25	25	6 13 3	41/3	35/-
T.C. & M.	£1	22/-	−6d	8½	8½	7 14 6	31/-	23/6
Telephone Mfg.	5/-	5/3	−3d	10	10	9 10 6	8/-	5/3
Telephone Rentals	5/-	10/-		12½	12½	6 5 0	12/6	9/6
Thompson (John)	5/-	24/6	−6d	25	25	5 2 0	37/-	23/6
Thorn Elec.	5/-	21/3		15	17½	4 2 3	26/3	16/3
Thornycroft	£1	27/-	−6d	12½	12½	9 5 3	37/6	21/3
Tube Investments	£1	52/9		13½	15	5 13 9	70/-	51/3
Vactric	5/-	14/6	−6d	17½	25	8 12 6	23/9	12/9
Veritys	5/-	6/9		12½	12½	9 5 3	9/3	6/9
Walsall Conduits	4/-	11/9		20	20	6 16 3	15/-	11/-
Ward & Goldstone	5/-	24/6	+1/-	35	40	4 1 9*	29/-	18/6
Watford	2/-	6/-		25	25	8 6 9	6/9	5/9
Westinghouse	£1	33/9		18	10*	5 18 6	41/3	28/9
West, Allen	5/-	9/9	−3d	15	15	—	13/6	9/6
Wolf Electric	5/-	9/-		20	20	5 11 0*	13/9	8/9

Westinghouse Results

The £1 shares of the Westinghouse Brake & Signal Co. have been well supported since the preliminary announcement of higher earnings and of a 10 per cent dividend for the year ended last September. This compares with the last year's distribution of 18 per cent, paid before the doubling of the capital by a scrip issue and its further increase to £7·1 million by a cash offer of new shares. Allowing for the scrip issue, this year's dividend represents therefore an improvement of 1 per cent. The increase is accommodated by an expansion of some 19 per cent in the net group profit to £906,000 (after much heavier charges for taxation and depreciation), which covers rather more than twice over the net amount distributed on the increased capital. Standing in the market at a little above the official quotation of 33s 9d, the shares offer a yield of close on 6 per cent.

Decca Results

There was little reaction from Decca Record shares to the company's preliminary statement on the annual results, revealing an advance of 30 per cent in the net profit to £565,000 (after tax) for the twelve months ended in March 1957. Good figures had been virtually assured by the estimate at last year's meeting (held after the 1956–57 financial period had already ended) of a considerable increase in earnings, and by the evidence in the E.M.I. report and elsewhere of a booming demand for gramophone records. The unchanged dividend of 43¾ per cent is payable on capital increased by a "rights" issue, and appears to be covered 1½ times by the available surplus. With more than three-quarters of the current year now completed, the company is able to report a further considerable expansion of turnover in the first nine months of this period. The company's 4s ordinary shares have been quoted at around 27s, and the "A" (non-voting) shares at 25s to yield 7 per cent.

Preference Shares

Industrial preference shares have remained in steady demand. Buyers now obtain yields of a fraction over 6 per cent from top-grade issues such as English Electric 6½ per cent preference at 21s 6d, and B.I.C.C. 5½ per cents at 18s 3d. Lancashire Dynamo 5½ per cents have been available lately, also at 18s 3d. On Ferranti "sevens" at 21s 9d the return is nearer 6½ per cent, while on the same company's 5½ per cent shares it exceeds 7 per cent. E. K. Cole 5½ per cents have been offered at 17s 6d, to yield 6½ per cent, and returns of a few shillings more are shown on the 4½ per cent preference shares of Plessey and Scottish Cables, both at about 14s.

REPORTS and DIVIDENDS

Hawker Siddeley Group, Ltd.—The annual meeting was held on 8th January, Sir Thomas Sopwith (chairman) presiding. In the course of his review of the year, the chairman said that the acquisition of the Brush Group and Dosco had changed the character and structure of the group. Two years ago the net assets of the group were divided in the proportion of 85 per cent aviation and 15 per cent industrial. To-day they were roughly 30 per cent aviation and 70 per cent industrial. Referring to the Hawker Siddeley Nuclear Power Co., Ltd., the chairman said that the company had been examining a number of reactor system projects for land and marine use. It had also been carrying out research and development particularly in the metallurgical and chemical fields for reactor systems of advanced character. The company was now well placed for undertaking specialised reactor project studies. In equal partnership with John Brown & Co., Ltd., a company, known as Hawker Siddeley John Brown Nuclear Construction, Ltd., had been formed to act as the focal point for the resources of both groups of companies in this field. It must be emphasised that all this nuclear work was of a long-term and exploratory nature. Big results must not be expected in the immediate future.

The acquisition of the Brush Group of companies had added an organisation engaged in the design and manufacture of diesel engines, diesel-electric generating plant and other power installations for industrial and marine purposes, including transformers, turbo-alternators, steam and gas turbines, switchgear, diesel-electric locomotives, fusegear, gas and dual-fuel engines and free piston gasifyers. The Brush Group had nine manufacturing subsidiaries, and in recent years the Group's exports had exceeded 65 per cent of its annual turnover. The projects on which Brush was at present engaged included the supply of 160 diesel generating sets and equipment to Argentina, free piston turbo-compressor plant for Australia, nearly all the stand-by diesel generating sets for the uranium mines being developed in the Blind River area of Canada, on the shores of Lake Huron, and the diesel-electric equipment required by R.C.A. Victor, Ltd., of Canada, to provide a continuous source of supply for its microwave telecommunication scheme. In the home market, twenty diesel-electric locomotives had been ordered from the Brush Group for the modernisation of the British Railways, and the Group had provided the motive power for the radio telescope at Jodrell Bank and also certain electronic equipment. Lack of capital had restricted expenditure on research and development for some years and the Hawker Siddeley board had already commenced to improve that situation so that the Brush Group could begin to take full advantage of its opportunities.

The Westinghouse Brake & Signal Co., Ltd.—The group trading profits for the year to 30th September last amount to £2,143,466, as compared with £1,733,122 for the preceding year, and after taxation of £1,049,340 the group net balance is £906,351 (against £763,679), of which £554,870 is dealt with in the accounts of the parent company. General reserve receives £36,207 and initial allowances reserve £50,000. It is proposed to pay a dividend for the year of 10 per cent (against 18 per cent) on capital increased by a 100 per cent scrip issue and a two-for-three rights issue. The balance carried forward is £374,493 (against £368,622 brought in).

Richardsons, Westgarth & Co., Ltd.—At an extraordinary meeting held on 8th January approval was given to the proposals for raising new capital. A preliminary announcement of the proposals was published in our issue of 20th December, and last week full details were announced. The loan stock issue is of £3·5 million 6 per cent convertible unsecured loan stock, 1976-81, at a price of 99. Approximately £2,955,000 stock is being offered to members on the basis of £1 loan stock for every four stock units held. Up to £100,000 stock will be reserved to meet applications from group staff and employees. The balance of stock not taken up will be available against excess applications from members.

The company's authorised capital is to be raised from £5 million to £10 million, and a one-for-one scrip issue is to be made by replacing the 5s stock units by 10s shares.

Marco Refrigerators, Ltd., reports a group profit for the year ended 30th September last of £41,547, as compared with £14,129 for 1955-56. Taxation requires £22,554 and it is proposed to pay a final ordinary dividend of 6½ per cent, making 8¾ per cent for the year (against 5 per cent).

Bowthorpe Holdings, Ltd., has acquired a substantial majority of the issued share capital of Tate Engineers, formed recently to take over the engineering activities previously carried on by Tate Bros., of Portslade, Sussex. Mr. A. E. Tate and his son, Mr. J. E. Tate, continue as directors of Tate Engineers and owners of the balance of the issued capital.

Radio Rentals, Ltd.—The main figures in the accounts for the year ended 31st August last were given in our issue of 27th December. In his circulated statement, Mr. P. Perring-Thoms (chairman and managing director) says that the increase in profit is due primarily to expansion and improved efficiency and not to any increase in profit margins. The impact of the Control of Hiring Order is continuing to restrict the radio side of the business very severely, but this handicap is not so apparent with television. The manufacturing company, Mains Radio Gramophones, Ltd., has again raised its output to a new record level, and the service departments have been geared up to meet an increased demand. Trading during the three months ended 31st December last has continued to be satisfactory.

British Industrial Plastics, Ltd.—The group's consolidated profits for the year to 30th September last amounted to £906,248, as compared with £833,774 for the previous year. Taxation requires £371,367 and the net profit is £296,073 (against £296,495). General reserve receives £150,000 and it is proposed to pay a final ordinary dividend of 12½ per cent, maintaining the distribution for the year at 20 per cent. The balance carried forward is £267,104 (against £256,126 brought in).

Cinema-Television, Ltd., proposes to capitalise £648,127 of general reserve and to make a one-for-one scrip issue of 25,925,080 ordinary shares of 6d each. After the scrip issue the ordinary stock will be converted into shares of 5s denomination. It is also proposed to change the company's name to Rank Cintel.

The Calcutta Electric Supply Corporation, Ltd., has declared an interim dividend of 3½ per cent, tax free.

Greenwood & Batley, Ltd., are paying an interim dividend of 5 per cent (unchanged).

New Companies

Shephard and Wilson, Ltd.—Registered 23rd December. Capital £10,000. To acquire the business of wholesale distributors of motor and electrical accessories now carried on by A. Shephard and W. G. Wilson at 2a, Baggeholme Road, Lincoln and elsewhere in Lincs and Leics as Shephard & Wilson. Directors: A. Shephard, W. G. Wilson, Mrs. Phyllis G. Shephard and Mrs. Elsie E. Wilson. Regd. office: 2a, Baggeholme Road, Lincoln.

Grunther Instruments, Ltd.—Registered 30th December. Capital £1,000. Manufacturers of and dealers in radio sets, television sets, thermionic tubes, cathode ray tubes, etc. Directors: G. W. Gurry and B. McCarthy. Regd. office: 103, Berrylands, Surbiton Hills, Surrey.

Donn Electronics (Beighton), Ltd.—Registered 1st January. Capital £500. To acquire the business of electronics engineers carried on by Lillian E. Barrett and G. F. Barrett at 8, Eyre Lane, Sheffield as Donn Electronics, etc. Directors: G. F. Barrett and Mrs. Lillian E. Barrett. Regd. office: 42, High Street, Beighton, near Sheffield.

Bankruptcy

F. W. Mason, trading as F. W. Mason & Son, at 20, Shamrock Avenue, Ipswich, electrical contractor and radio and television engineer.—Last day for receiving proofs for dividend 21st January. Trustee, Mr. R. A. Paterson, Archdeacons House, Northgate Street, Ipswich.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 20th January

BIRMINGHAM.—Birmingham Electric Club. "Safety in the Use of Electricity," by S. J. Emerson.

BRISTOL.—Royal Hotel. I.E.S. Bath and Bristol Centre. "Lighting for Television Studios."

CARDIFF.—At the South Wales Institute of Engineers, 6 p.m. I.E.E. Western Supply Group. "Earth Electrode Systems for Large Electric Stations," by J. D. Humphries.

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre, Radio and Measurements Group. "Some Aspects of Half-Wave Magnetic Amplifiers," by G. M. Ettinger, and "Some Transistor Input Stages for High-Gain D.C. Amplifiers," by Dr. G. B. B. Chaplin and A. R. Owens.

IPSWICH. — Electric House, 7.15 p.m. Ipswich and District Electrical Association. President's address, by C. T. Melling.

LONDON.—At the Institution of Electrical Engineers, Savoy Place, W.C.2, 6 p.m. Electrical Association for Women. Caroline Haslett Trust Lecture, by Miss M. P. Binks.

NEWCASTLE-UPON-TYNE. — King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. "Ferrites," by Dr. F. Brailsford.

Tuesday, 21st January

BIRMINGHAM.—Birmingham Exchange and Engineering Centre, 7 p.m. Institute of Physics, Midland Branch. "The Computer and its Uses," by C. Robinson.

DARLINGTON.—College of Further Education, 7 p.m. I.Prod.E. Tees-side Section. "Nuclear Power and its effect on the Production Engineer," by I. Munro.

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. Informal lecture on "The Importance of Research in Hearing and Seeing to the Future of Telecommunication Engineering," by Dr. E. C. Cherry.

GATESHEAD.—A.S.E.E. Tyneside Branch. Visit to Quasi-Arc, Ltd., Team Valley Trading Estate.

GLASGOW.—Royal College of Science and Technology, George Street, 7 p.m. I.E.E. South-West Scotland Sub-Centre Radio and Measurements Group. "Some Aspects of Half-Wave Magnetic Amplifiers," by G. M. Ettinger, and "Some Transistor Input Stages for High-Gain D.C. Amplifiers," by Dr. G. B. B. Chaplin and A. R. Owens.

LEEDS.—C.E.G.B., Yorkshire Division, 1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Utilisation Group. "Recent Developments in Medium Voltage High-Breaking-Capacity Fuse Links," by R. H. Dean.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement and Control Section. Informal lecture on "The Effect of Modern Industrial Requirements on Electrical Instrument Design," by Dr. G. F. Tagg.

Hoare Memorial Hall, Church House, S.W.1, 9.30 a.m. British Nuclear Energy Conference. Symposium on Nuclear Energy. (Sponsored by the Institution of Chemical Engineers.)

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Measurement and Control Group. "Power System Protection, with particular reference to the Application of Junction Transistors to Distance Relays," and "A Dual-Comparator Mho-Type Distance Relay Utilising Transistors," by C. Adamson and L. M. Wedepohl.

Tuesday, 21st January, to Friday, 24th January

LONDON. — Victoria Halls, Bloomsbury Square, and the Connaught Rooms, W.C.2. E.D.A.—E.A.W. Conference of Electrical Demonstrators and Housecraft Advisers.

Wednesday, 22nd January

BOURNEMOUTH.—Grand Hotel, 6.30 p.m. I.E.E. Southern Centre. "Electricity in Modern Commercial Horticulture," by C. A. Cameron Brown and A. W. Gray.

CARDIFF.—Department of Physics, University College of South Wales, 6.30 p.m. British Institution of Radio Engineers, South Wales Section. "Applications of Magnetic Recording," by J. Cunningham-Sands.

LEEDS. — The University, Chemistry Department Lecture Theatre, 7 p.m. Institution of Chemical Engineers, North Western Branch. "Heat Transfer Analogues," by N. L. Franklin, G. T. Matthews and J. E. Cook.

LIVERPOOL.—The Temple, Dale Street. I.E.E. Mersey and North Wales Centre. "Alternating Current Systems for Railway Electrification," by A. D. Gratton. (Joint meeting with the Liverpool Engineering Society.)

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio and Telecommunication Section. Lecture on "Special Problems of Broadcasting in Sweden," by E. Esping.

Conference Room, 4th Floor, Waterloo Bridge House, S.E.1, 5 p.m. Institution of Post Office Electrical Egnineers, London Centre. Informal meeting. "Subs. Line Concentrators — Their Development and Application," by A. J. Barker and G. M. Blair.

A.S.E.E. South East London Branch. Visit to the New Cross Telephone Exchange.

At the Institution of Civil Engineers, Great George Street, S.W.1, 5.30 p.m. Institute of Fuel. "The Shatter Strength of Cokes from High Volatile Coals: Use of Plastometer Measurements on Blends for Test-Oven Experiments," by Dr. D. W. Gillings and W. Lawson.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institution, Corporation Road, 6.30 p.m. I.E.S. Tees-side Group. "Lighting for Photography," by T. Gibson.

NOTTINGHAM.—East Midlands Electricity Board's Showroom Theatre, Smithy Row, 7.30 p.m. A.S.E.E. Nottingham Branch. "Railway Electrification," by I. Bagdzinski.

Wednesday, 22nd January, to Friday, 31st January

LONDON.—Olympia. International Hotel and Catering Exhibition.

Thursday, 23rd January

CARDIFF.—Sophia Gardens Pavilion, 6.45 p.m. I.E.E. Western Centre. Faraday Lecture, "The Electrification of the British Railways," prepared by the late G. H. Fletcher and delivered by R. Ledger.

CHATHAM.—Medway College of Technology, 7 p.m. I.E.E. London Graduate and Student Section. District meeting. "Colour Television," by A. Harris.

CROYDON.—Greyhound Hotel, High Street, 8 p.m. A.S.E.E. South London Branch. "Radar Aids to Navigation," by N. E. R. Vaus.

EXETER.—Electricity Showrooms, Bedford Street, 3 p.m. I.E.E. South-Western Sub-Centre. "Safety in the Use of Portable and Transportable Electrical Equipment in Industry," by J. W. Bunting.

Friday, 24th January

BRISTOL.—Grand Hotel. A.S.E.E. Bristol and West of England Branch. Annual dinner.

CARLISLE. — Technical College, 7 p.m. I.E.E. North-Eastern Centre. District meeting. "Cathodic Protection," by L. B. Hobgen, K. A. Spencer and P. W. Heselgrave.

COVENTRY.—G.E.C. Ballroom, Copsewood. Coventry Electric Club. Annual ladies' night.

CREWE.—Royal Hotel, 7.30 p.m. A.S.E.E. Stoke and Crewe Branch. "Magnetic Amplifiers," by D. C. Evans.

GLASGOW. — A.S.E.E. Glasgow Branch. Theatre night.

LONDON.—Pepys House, 14, Rochester Row, Westminster, S.W.1, 7 p.m. Junior Institution of Engineers. "Axle Counting in Railway Signalling," by H. J. N. Riddle

NEWCASTLE-UPON-TYNE. — At the Mining Institute, 6.15 p.m. North East Coast Institution of Engineers and Shipbuilders. "Extended Heat Exchange Surface for Boilers," by R. E. Zoller.

WEYMOUTH.—South Dorset Technical College, 6.30 p.m. I.E.E. Southern Centre. "Gyroscopic Stabilisers," by H. Neal.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 27th January:—

No. 766,060 (design). Class 9. Electrical apparatus and instruments and laboratory utensils and parts, all made wholly or partly of ceramic materials.—Deutsche Gold-und Silber - Scheideanstalt Vormals Roessler, Frankfurt-am-Main, Germany. Address for service, c/o Elkington & Fife, Bank Chambers, 329, High Holborn, London, W.C.1.

No. 768,590 (design). Class 9. Electronic apparatus for performing switching operations by means of its sensitivity to the proximity of moving objects; and counting, measuring, indicating, signalling and checking (supervision) apparatus incorporating such electronic switching apparatus. FIELDEN AUTOMATION (design). No. 768,691. Class 9. Electrical apparatus for measuring variable quantities, for indicating and recording such measurements and for controlling the operation of other apparatus in order to take account of the variations so measured.—Fielden Electronics, Ltd., Paston Road, Wythenshawe, Manchester, 22.

METRO-SOUND (design). No. 768,072. Class 9. Radio receiving apparatus; television receiving apparatus; sound recording apparatus; gramophones; and parts; and gramophone records.—Metro-Sound Manufacturing Co., Ltd., 11-12, Neeld Parade, Wembley Hill Road, Wembley, Middx.

C-OMANUAL. No. 768,975. Class 9. Electric welding apparatus (not machines).—A. O. Smith Corporation, Milwaukee, Wis., U.S.A. Address for service, c/o Stevens, Langner, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, London, W.C.2.

JESTER. No. 769,095. Class 9. Electric batteries, cells, accumulators; radio receivers, television apparatus, gramophones, radio-gramophones, record players; and cases for electric torches.—Berec Radio, Ltd., Hercules Place, Holloway, London, N.7.

SKY EMPEROR. No. 769,343. SKY LORD. No. 769,344. SKY PRINCE. No. 769,346. Class 9. Electric batteries, cells, accumulators; radio receivers, television apparatus, gramophones, radio-gramophones, record players; and cases for electric torches.—Ever Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, London, N.7.

NEW PATENTS — Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) will be obtainable after 22nd January from the Patent Office, 25, Southampton Buildings, London, W.C.2

1953

17230. Sparcatron, Ltd.—Apparatus for cutting or working electrically conductive materials. 22nd June, 1954. (789442.)

1954

4275. Metropolitan-Vickers Electrical Co., Ltd.—Apparatus and methods of comparing the frequencies and/or phase angles of polyphase circuits. 2nd February, 1955. (789372.)

19831. Chadburns (Liverpool), Ltd.—Electric remote control systems, ship's telegraphs and the like. 22nd June, 1955. (789535.)

20094. Avery, Ltd., W. & T. (Schenck Maschinenfabrik Ges., C.).—Device for the conversion of measuring values into electric impulses. 9th July, 1954. (789376.)

23343. General Electric Co.—Refrigerators having automatic defrosting systems. 11th August, 1954. (789537.)

23774. Mullard Radio Valve Co., Ltd.—Automatic synchronisation of time base circuit arrangements. 15th November, 1955. (789315.)

28361. Corning Glass Works.—Cathode-ray tube manufacture. 1st October, 1954. (789378.)

29400/29553. Rotol, Ltd.—Polyphase a.c. systems. 7th October, 1955. (789517/8.)

31161. Maclaren & Co., Ltd., R., Richmond, T. G., Maclaren, I. G., and Adam, I. R.—Thermal-time controlled switches. 12th August, 1955. (789450.)

33035. General Electric Co., Ltd., Bonhomme, V. G., and Beesley, J. H.—Electrical telemetering systems. 7th November, 1955. (789541.)

34332. Standard Telephones & Cables, Ltd.—Relay register. 26th November, 1954. (789602.)

37036/7. Electric & Musical Industries, Ltd.—Magnetic tape reproducing apparatus. 21st December, 1955. (789519/20.)

1955

585. Simplex Electric Co., Ltd.—Storage water heaters. 9th January, 1956. (789606.)

2596. Alkaline Batteries, Ltd.—Electric accumulators. 12th December, 1955. (789453.)

4521. Metropolitan-Vickers Electrical Co., Ltd.—Electronic trigger circuit arrangements. 31st January, 1956. (789608.)

6786. Parmiter, Hope & Sugden, Ltd.—Electric fuses. 28th February, 1956. (789545.)

8776. Mullard Radio Valve Co., Ltd.—Cases for electrical equipment. 6th June, 1956. (789387.)

10732. Frost & Co., Ltd., H.—Element bars for bar-type electric radiators. 16th April, 1956. (789610.)

14589. General Electric Co., Ltd.—Methods of sealing a tubular glass neck portion to a glass wall. 18th May, 1956. (789612.)

15829. Electric & Musical Industries, Ltd.—Magnetic recording media. 1st June, 1956. (789613.)

16651. Busch-Jaeger Dürener Metallwerke Akt.-Ges.—Automatic electric cut-outs. 9th June, 1955. (789326.)

21258. Parmeko, Ltd.—Electrical terminals. 23rd July, 1956. (789471.)

21699. Philips Electrical Industries, Ltd.—Automatic telegraph exchange systems. 27th July, 1955. (789394.)

22920. Vauxhall Motors, Ltd., and Ripaults, Ltd.—Plug and socket connector assemblies for electric wires or cables. 17th July, 1956. (789550.)

23613. Picard, M.—Electric battery lamps. 16th August, 1955. (789622.)

24516. Siemens-Schuckertwerke Akt.-Ges.—Semi-conductor mixing devices. 25th August, 1955. (789899.)

25437. Westinghouse Air Brake Co.—System for the selective energisation of a number of electrical circuits in accordance with codes punched in a tape. 5th September, 1955. (789330.)

26226. Ericsson Telephones, Ltd.—Manufacture of germanium. 20th August, 1956. (789625.)

26859. Schiffmann, A.—Connectors for electrical current conductors. 20th September, 1955. (789332.)

30064. Gustafsson, G. V. A., and Olsson, C. O.—Methods for measuring electric potentials. 20th October, 1955. (789567.)

30232. Mullard Radio Valve Co., Ltd.—Electrical regulating circuits. 21st October, 1955. (789405.)

32789. Philips Electrical Industries, Ltd.—Magnetic switching circuits including junction transistors. 16th November, 1955. (789478.)

33035. Erie Resistor Corporation.—Method of making thin flat electroded ceramic elements. 18th November, 1955. (789336.)

34019. Philips Electrical Industries, Ltd.—Methods of applying an ohmic contact to semi-conductive bodies of a p-type conductive telluride of a bivalent metal. 28th November, 1955. (789338.)

34565. Metallurgie du Nickel.—Machine for filling tubes with powder substances for making electric heaters. 2nd December, 1955. (789633.)

34642. General Electric Co., Ltd.—Nuclear reactor arrangements. 22nd November, 1956. (789482.)

34649. Siemens-Schuckertwerke Akt.-Ges.—Arrangements for controlling power to be fed to a load by means of semi-conductor resistances more especially transistors. 2nd December, 1955. (789412.)

35577. Soundscriber Corporation.—Scanning mechanism for magnetic tape recorders. 12th December, 1955. (789554.)

35739. Marconi's Wireless Telegraph Co., Ltd.—Periodically operating electric switch devices. 5th October, 1956. (Cognate application 28917, 21st September, 1956.) (789483.)

36157. Research Corporation.—Electrostatic treating systems. 16th December, 1955. (789555.)

36321. Skillman & Co., Pty., Ltd., T. S.—Assembly of telecommunication apparatus. 19th December, 1955. (789340.)

36975. Bendix Aviation Corporation.—Reciprocating electromagnetic pump. 23rd December, 1955. (789634.)

36976. Fisch, R. A.—Insulating shield and mounting device for colour television tube. 23rd December, 1955. (789413.)

1956

657. National Cash Register Co.—Digital computer electrical data classifying system. 9th January, 1956. (789486.)

1228. Standard Telephones & Cables, Ltd.—Oscillator circuit for transistors. 13th January, 1956. (789636.)

2292. Micafil, Ltd.—Apparatus for producing electrical impulses. 24th January, 1956. (789348.)

3066. Western Electric Co., Inc.—Coupling arrangements for electromagnetic wave transmission paths. 31st January, 1956. (789639.)

3726/7. Burndy Engineering Co. Inc.—Electrical connectors for joining parallel conductors. 7th February, 1956. (789523/4.)

4736. Brennan, J. B.—Electrolytic condensers. 15th February, 1956. (789488.)

6171. Philips Electrical Industries, Ltd.—Transistor push-pull amplifying circuit arrangements. 28th February, 1956. (789420.)

8010. Isoplast Ges., and Röhm, R. (trading as Müller Coroplast Komm.-Ges., F.).—Electric plugs. 14th March, 1956. (789493.)

9180. Barmer Maschinenfabrik Akt.-Ges.—Electrically driven textile spinning, twisting and winding machines. 23rd March, 1956. (Addition to 770710.) (789573.)

9307. Kuhn, A.—Adjustable series resistance especially for electromagnetic vehicle brakes. 26th March, 1956. (789356.)

11179. Hazeltine Corporation.—Transistor frequency converter. 12th April, 1956. (789428.)

11791. Western Electric Co., Inc.—Electric circuits employing transistors. 18th April, 1956. (789429.)

12974. Westinghouse Electric International Co.—Electrostatic precipitators. 27th April, 1956. (789360.)

12994. Ateliers de Constructions Electriques de Charleroi.—Sound recording apparatus. 27th April, 1956. (789577.)

17008. General Electric Co.—Thermionic cathodes. 1st June, 1956. (789654.)

17632. Philips Electrical Industries, Ltd.—Push-pull amplifiers. 7th June, 1956. (789582.)

18405. Micafil Akt.-Ges. Werke für Elektro-Isolation & Wicklerei-einrichtungen.—Winding machines. 14th June, 1956. (789434.)

19617. Hazeltine Corporation.—Neutralised radio frequency amplifier. 25th June, 1956. (789584.)

20346. Telefunken Ges.—Electromechanical transducers for use in sound recording or reproducing systems. 2nd July, 1956. (789367.)

20593. Philips Electrical Industries, Ltd.—Magnetrons. 3rd July, 1956. (789586.)

21545. Babcock & Wilcox, Ltd.—Tubulous vapour generators and method of manufacturing such generators. 12th July, 1956. (789587.)

22773. Maschinenfabrik Oerlikon.—Duplex parallel armature winding in at least four layers for commutating machines. 23rd July, 1956. (789505.)

27176. General Electric Co.—Power operated bending tools. 5th September, 1956. (789589.)

27276. Ericsson Telephones, Ltd.—Electromagnetic counting means. 6th September, 1956. (789506.)

30008. General Electric Co.—Coupling for a vacuum cleaner dirt bag. 2nd October, 1956. (789509.)

30433. Western Electric Co., Inc.—Electrical information storage systems. 5th October, 1956. (789660.)

Laundry Exhibition

The Laundry, Dry Cleaning and Allied Trades' Exhibition will be held from 17th to 26th July next at Olympia, London. In addition to British exhibitors a number of manufacturers in countries overseas will take part. The organisers are F. W. Bridges & Sons, Ltd., Grand Buildings, Trafalgar Square, London, W.C.2.

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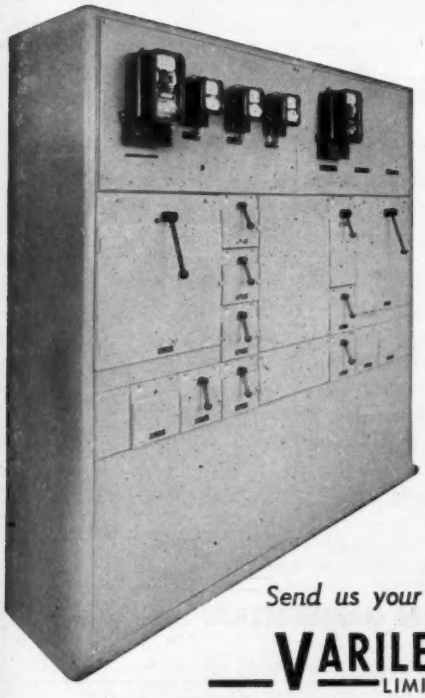

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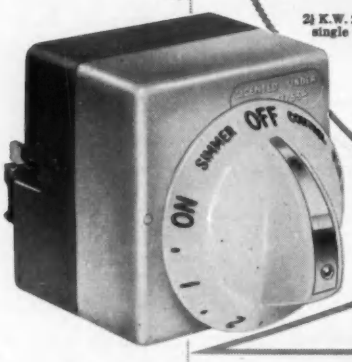

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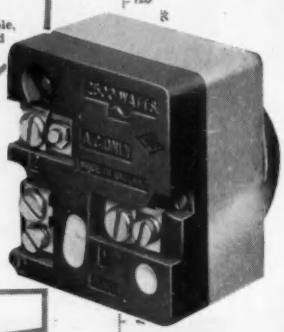

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CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Aberdare.—U.D.C. 25th January. Electric lamps for the year ending 31st March, 1959. Surveyor, Vestry Hall.

Antrim.—County Education Committee. 30th January. Electrical installation in Dunmurry Primary School extension. McAuslan & Abbott, consulting engineers, 16, Bedford Street, Belfast.

Australia.—Electricity Commission of New South Wales, Sydney. 3rd February. Cables and earthing conductors. (E.S.B. 31674/57. Ten/30180.)* 19th May. Three 120 MW and two 200 MW turbo-generator sets. (E.S.B. 31681/57. Ten/30195.)*

State Electricity Commission of Victoria, Melbourne. 29th January. Six 66,000 V transformers. (E.S.B. 31806/57. Ten/30178.)* 12th February. 100 sets of lightning arrestors. (E.S.B. 31807/57. Ten/30212.)* 12th March. Load control equipment. (E.S.B. 31809/57. Ten/30227.)*

P.M.G.'s Department, Melbourne. 20th March. Television equipment and associated plant. (E.S.B. 31448/57. Ten/30131.)*

Ayr.—County Council. Trunk road lighting equipment. (See this issue.)

Bedlington. — U.D.C. 15th February. Electrical goods (Specification H/12/58), for the year ending 31st March, 1959. A. K. Dennis, engineer and surveyor, Council Offices.

Bradford.—Corporation Waterworks Committee. 12th February. Pump sets, starters, switchgear, etc., for proposed Avenel booster station. Waterworks engineer, 50, Darley Street.

Burma.—Burma Purchase Board, Rangoon. 20th January. Enamelled wire. (E.S.B. 31794/57. Ten/30159.)*

Ceylon. — Ceylon Transport Board, Colombo. 22nd January. Forty 6 kW electric generating sets. (E.S.B. 219/58. Ten/30172.)* Electrical workshop testing equipment. (E.S.B. 220/58. Ten/3018.)*

Director of Irrigation, Tender Board, Colombo. 28th January. Five diesel-engined generating sets. (E.S.B. 31658/57. Ten/30168.)*

Cheltenham.—Corporation. 25th February. Rewiring of electrical installation at Town Hall. (See this issue.)

Colchester.—Corporation. 3rd February. Trunk road lighting equipment. (See this issue.)

Formosa.—Central Trust of China, Taipei. 5th February. Two power panels, four sets of automatic voltage regulated selenium rectifiers, and two battery charge-discharge control panels. (E.S.B. 291/58.I.C.A. Ten/30216.)*

Friern Barnet.—U.D.C. 3rd February. Street lighting lamps for one year from 1st April next. (See this issue.)

Great Yarmouth. — Corporation. 31st January. Electric cables for one year. (See this issue.)

Greece.—Public Power Corporation, Athens. 25th January. Gas turbine power plant. (E.S.B. 31731/57. Ten/30170.)*

Halesowen. — Borough Council. 30th January. Electric lamps for the year ending 31st March, 1959. Borough engineer, the Council House.

Hythe.—Corporation. 10th February. Trunk road lighting equipment. (See this issue.)

India.—Madras State Electricity Board. 30th January. House service meters. (E.S.B. 864/58. Ten/30301.)*

Government of Sikkim, Gangtok. 25th April. Plant for Rongni Chhu hydro-electric project, including turbines, generators, switchboards, earthing equipment, etc. (E.S.B. 31490/57. Ten/30114.)*

Newbury.—Corporation. 7th February. Trunk road lighting equipment. (See this issue.)

New Zealand.—G.P.O., Wellington. 17th February. Miniature glass cartridge fuses. (E.S.B. 31722/57. Ten/30166.)* 19th February. Instrument cordage. (E.S.B. 31723/57. Ten/30225.)*

Christchurch Electricity Department. 25th February. Twelve 750 kVA transformers with spare h.v. bushings. (E.S.B. 31654/57. Ten/30213.)* 17th March. Substation switchgear. (E.S.B. 31577/57. Ten/30115.)*

Auckland Hospital Board. 3rd March. X-ray diagnostic equipment. (E.S.B. 600/58. Ten/30294.)*

State Hydro-Electric Department, Wellington. 22nd April. Centralised load control equipment for Southland electric power supply area. (E.S.B. 31647/57. Ten/30243.)*

Northamptonshire.—County Council. Contractors wishing to tender for the electrical installation for the second instalment of Corby Technical College should apply by 4th February. (See this issue.)

Pakistan.—Department of Supply and Development, Karachi. 11th February. Electrical equipment, including cable, terminal boxes, tubular poles, insulators, fluorescent fittings, switches, street lamp posts and fittings, lamps, covers, brackets and distribution boxes. (E.S.B. 309/58.I.C.A. Ten/30252.)*

Rhodesia and Nyasaland.—Federal Tender Board, Causeway. 31st January. Hospital X-ray plant. (E.S.B. 31643/57. Ten/30175.)*

South Africa.—Stores Department, South African Railways, Johannesburg. 24th January. Electric cable. (E.S.B. 31705/57. Ten/30199.)* Insulated cable and wire. (E.S.B. 31693/57. Ten/30133.)* 7th February. Electric passenger lifts. (E.S.B. 744/58. Ten/30297.)* 14th February. Two diesel-driven generating sets. (E.S.B. 290/58. Ten/30247.)*

Union Tender and Supplies Board, Pretoria. Jointing sleeves. (E.S.B. 218/58. Ten/30174.)*

Durban Electricity Department. 31st January. L.v. electric fuses. 14th February. Emergency standby plant. (E.S.B. 31706-7/57. Ten/30147-8.)*

Southwark.—Borough Council. 5th February. Electric lamps (Form No. 8). E. J. Pitt, town clerk, Southwark Town Hall, Walworth Road, S.E.17.

United States.—Mobile Corps of Engineers, Alabama. 30th January. Four 36,111 kVA a.c. generators. (E.S.B. 532/58. Ten/30278.)*

Uruguay.—Administracion de Ferrocarriles del Estado. 7th February. 10,000 dry cells (1½ V) for telegraphic or telephonic use. (E.S.B. 31738/57. Ten/30233.)*

Administracion General de las Usinas Electricas y los Telefonos del Estado. 25th February. Terminal and junction boxes for underground armoured cables. (E.S.B. 31742/57. Ten/30232.)*

Watford.—Borough Council. 5th February. Electric lamps and tubes for the year ending 31st March, 1959. Borough engineer, Town Hall.

Wem.—U.D.C. 11th February. Electrically driven submersible pump, together with ancillary equipment, for water supply scheme. Engineer and surveyor, Barber House.

Willesden.—Corporation. 15th February. Electrical equipment, cables, conduit and lamps for the year ending 31st March, 1959. (See this issue.)

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Durham.—County Education Committee. Electrical work at schools:—Chopwell East County School (£1,817), and Hebburn R.C. Aided School (£245).—T. Mitchelson. Ford County and Modern School (£368), and Stockton Kiora Community and Youth Centre (£265).—North of England Engineering & Electrical Co. Felling Heworth Modern School (£5,772).—J. Robinson.

Lancashire.—County Council Education Committee. Accepted. Renewal and modifications to the electrical installation at Littleborough Central County School (£3,912).—Brindle & Kirby. Renewal of the electrical installation at Accrington Woodnook County and County Secondary Schools (£1,997).—R. E. Jervis (Manchester).

London.—L.C.C. Supply and installation of electric hot water systems in eighty dwellings at the St. Helier estate, Merton and Morden (£4,259), and in 185 dwellings at the Castelnau (Group 1), Barnes (£11,415).—London Electricity Board. One electric passenger lift and one goods lift in new school equipment depot, Lambeth (£5,788).—Express Lift Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Aireborough.—Houses (155), Shaw Lane, Guiseley; U.D.C. surveyor, Micklefield House, Rawdon, near Leeds.

Ashton-under-Lyne. — Additional 168 houses on Hazlehurst site; A. T. Kemp, borough surveyor, Municipal Buildings.

Aspatria (Cumberland).—New creamery for the Milk Marketing Board (second stage); John Laing & Sons, builders, Dalston Road, Carlisle.

Beckenham.—Shops and flats; L. A. Butterfield, architect, 3, Field Court, Gray's Inn, London, W.C.1.

Birmingham.—Lea Mason C.E. Mixed Secondary Modern School, Lee Bank Road, Central Area; A. G. Sheppard Fidler, city architect, Civic Centre, 1.

Bolton.—Block of workshops and offices on site off Smethurst Lane; H. Compsty & Son, Ltd., 50, Whitecroft Road.

Bournemouth.—Old people's hostel, Castle Lane, Winton; borough architect.

Bradford-on-Avon.—Houses (63); U.D.C. surveyor, Westbury House, Bradford-on-Avon, Wilts.

Bridgwater.—Factory extension; S. Leffman, Ltd., Provident Place.

Brighton.—Houses (808), to be erected during 1958; D. J. Howe, borough engineer, 26/30, King's Road.

Bristol.—Sub-divisional police station, Knowle (£32,500); city engineer, 470, Bath Road, Bristol, 4.

Chelmsford.—Shops, with offices above (five-storey building), 13-15, Friars Place; R. Seifert, architect, 28, Great Ormond Street, London, W.C.1.

Cheltenham.—Showrooms for Sharpe & Fisher, Ltd., Pittville Street; Costelloe & Kemple, Ltd., builders, Alstone Lane.

Cheshunt.—Fire and ambulance station in College Road; county architect, County Hall, Hertford.

Chester.—R.C. church, Blacon estate; Reynolds & Scott, architects, 9, Albert Square, Manchester.

Chorley.—Works, Lighthurst Lane; Leyland Motor Co., Ltd., Leyland, Lancs.

Corby.—Neighbourhood centre, Lodge Park estate, including 15 shops; clerk, Urban Council Offices, Corby, Northants.

Cowes (I.O.W.).—Health centre, Consort Road; county architect, County Hall, Newport.

Darlington.—Corn exchange, Victoria Road; E. A. Tornbohm, borough architect.

Daventry.—Houses (100) for employees of British Timken; borough architect.

Doncaster. — Crematorium (£85,000); borough architect.

Dorchester.—Admission unit and convalescent villas, Herrison Hospital; Staverton Builders, Ltd., Staverton Bridge Mills, Totnes.

Dudley.—Additional science facilities at Holly Hall and Blue Coat Secondary Schools, and modernisation of laboratories at Dudley Grammar School; F. H. Gibbons, borough engineer, The Council House.

Edinburgh. — Rebuilding offices, St. Andrews Square, for the Scottish Widows' Fund & Life Assurance Society; Spence & Partners, architects, 40, Moray Place, Edinburgh.

Enfield.—Nurses' home at Chase Farm Hospital; regional architect, North East Metropolitan Regional Hospital Board, 3, Queen Anne Street, London, W.1.

Erith.—Great Harry Hotel (£30,000); Herbert Richardson & Co., Ltd., builders, Herbert House, Slade Green.

Glasgow.—District colleges of further education on sites at Milton, Easterhouse and Cardonald, and college of nautical studies at Adelphi Street corner site; J. MacNab, architect, Education Department, Bath Street, C.2.

Grantham. — Flats, Grange Gardens (£37,800); borough architect.

Hebburn (Co. Durham).—Factory additions, Bedewell Works, for Baker Perkins, Ltd.; Bewley & Scott, Ltd., builders, Dunston-on-Tyne.

Second stage of new technical college; Thomas Clements & Son, builders, Jesmond, Newcastle-on-Tyne (in lieu of tender withdrawn).

Hillingdon.—First instalment of primary school, Ryfield Avenue (£108,228); Middlesex county architect, 1, Queen Anne's Gate Buildings, London, S.W.1.

Huntingdon.—Factory, Ermine Street; Silent Channel Co. Ltd. (Huntingdon), 38, Victoria Street, London, S.W.1.

Keighley. — Houses (113), Braithwaite Street; borough architect.

Kettering.—Houses and bungalows (35); R.D.C. surveyor, London Road Offices.

Laindon. — Markhams Chase Primary School (additions to cost £18,000); H. Conolly, county architect, County Hall, Chelmsford.

London.—Offices, Rood Lane; Robin Seifert, architect, 28, Great Ormond Street, W.C.1.

New works, Cricklewood; Imperial Machine Co., Ltd., Edgware Road, N.W.2.

Maisonnettes (36), Glaucus Street, Poplar; J. & J. Dean, Ltd., builders, Ruckholt Road, E.10.

New building for Imperial College of Science and Technology; John Laing & Son, Ltd., builders, Bunns Lane, N.W.7.

Science laboratories for St. Joseph's College, Beulah Hill; Holliday & Greenwood, Ltd., builders, 11, Buckingham Palace Gardens, S.W.1.

Maidenhead.—Block of six shops and two-storey maisonnettes, with stores, garages, etc., Spencers estate; borough engineer, 14, Craufurd Rise.

Manchester.—Two-storey factory premises, Lord Street/Elsworth Street, Cheetham; P. Cummings, architect, Jacey House, Oxford Street.

Geology and mathematics building for University; J. Gerrard & Sons, Ltd., builders, Swinton.

Marlborough.—C.E. aided school, Aldbourne; county architect, County Hall, Trowbridge.

Menai Bridge.—Secondary school; Taylor, Whalley & Spyra, consulting engineers, 103, Portland Street, Manchester.

Middlesbrough.—Additions to Middlesbrough Maternity Hospital; P. H. Knighton, chief architect, Newcastle Hospital Board, Benfield Road, Newcastle-on-Tyne.

Milford Haven.—Houses and flats (27), Gelliswick estate; surveyor, Town Hall.

Newcastle-on-Tyne.—Offices, Shields Road, for C. A. Parsons & Co.; Stephen Easten, Ltd., contractors, Westgate Grange, Newcastle.

New Milton.—Junior county school; county architect, The Castle, Winchester.

Newport (Mon).—Junior school, Ringland (£75,000), girls' grammar school, Duffryn (£225,000), and electrical and motor mechanics' shops, Lyne Road Technical College; borough surveyor, Civic Centre.

Newport (I.O.W.). — Geriatric unit (£72,000), Whitecroft Hospital; Westridge Construction Co., Ltd., builders, 86, High Street, Ryde.

North Riding.—Office block at Guisborough; H. J. Knowles, county architect, County Hall, Northallerton.

Norwich.—R.C. secondary modern school, Jessop Road; D. Percival, city architect.

Paisley.—Fruit freezing and storage plant, Stevenson Street (£45,000); J. Robertson & Sons, Ltd., Paisley.

Peterborough.—Private housing estate, Gunthorpe; C. W. Shelton, Ltd., builders, South Street, Stanground, Peterborough.

Runcorn.—Houses (120), Grange estate; U.D.C. surveyor, Town Hall.

St. Albans.—Showrooms, St. Peter's Street; Freeman, Hardy & Willis, Ltd., Crown Buildings, Walnut Street, Leicester.

Salford.—Health offices (£312,000); city engineer, Town Hall, 3.

Scarborough.—Fourteen flats, Wreyfield Drive; E. Hunter, Ltd., builders, Beaconsfield Street, Scarborough.

Sheffield.—Additional wards for Royal Infirmary; Teather & Hadfield, architects, Mazda Buildings.

Southall.—Houses (48), Clearmount Cottage and Langdon's Farm sites; J. E. Syrett, town clerk, South Road, Southall, Middx.

Southampton.—Shops and showrooms, Above Bar; W. E. Chivers & Sons, Ltd., builders, Devizes, Wilts.

South Shields.—Blocks of shops at Laygate (£51,000); John Reid, borough engineer.

Timperley.—Extensions to Broomwood C.P. School (£47,000); director of education, City Road, Chester.

Tynemouth.—Additional storey, Dove Marine Laboratory, for King's College; W. B. Edwards & Partners, 5, Claremont Buildings, Newcastle-on-Tyne.

Wakefield.—Combined community hall, welfare clinic and library, Kettlethorpe; city engineer, Town Hall.

West Hartlepool.—Housing developments at Bolton Grove for Taylor & Evans, Ltd., builders, Elwick Road, West Hartlepool.

Whitley Bay.—New block of 40 bedrooms at Rex Hotel; T. W. Grey, Front Street, Tynemouth.

Houses (81), Hartley East Farm, Wimpey & Co., Ltd., builders, Fenwick Terrace, Newcastle-on-Tyne.

Block of shops and offices, Whitley Road; F. P. Dodsworth, builder, Hillheads Road, Whitley Bay.

Wideopen (Co. Durham).—Development of the Woodlands Park estate (over 400 houses); J. T. Bell & Sons, Ltd., builders and contractors, Market Street, Newcastle-on-Tyne.

Wigston.—Houses (38), in connection with slum clearance rehousing; surveyor, Urban Council Offices, Wigston, Leicester.

Wigton.—Factory extensions for the British Rayophane Co., Ltd., Wigton.

Willesden.—Flats (44), Donnington Road; borough engineer, Town Hall, Dyne Road, Kilburn, N.W.6.

London Transport Rolling Stock

Orders for new Underground railway rolling stock are to be placed by London Transport with the agreement of the British Transport Commission. The trains will be used to renew existing rolling stock which is due for replacement and to improve services.

For the Metropolitan Line services to Amersham, Chesham, and Watford, 248 new cars are to be ordered at a cost of over £5 million. The trains will be of a type specially designed for the Metropolitan services. All seats will be in facing pairs on each side of a central gangway and will have higher backs. Racks for light parcels will be provided. In addition, the cars will have pneumatic sliding doors. Each train will consist of four driving-motor and four trailer cars. The new rolling stock will have lightweight unpainted aluminium alloy bodies, rubber suspension, and fluorescent lighting. They will replace the present electric and steam hauled compartment type carriages in use on the line. Delivery will be timed to begin with the electrification of the Metropolitan Line between Rickmansworth and Amersham and Chesham (which is at present steam-operated) and the four-tracking of present double-track Metropolitan lines between Harrow-on-the-Hill and Rickmansworth, which are planned to be completed during 1961.

On the Circle Line, rush-hour conditions are to be improved by increasing the length of all trains from five to six cars. This will be achieved by adding to the District Line stock thirteen R stock cars of the latest type which are now on order. With the rearrangement of certain existing trains and the conversion of some cars at Acton Works, it will then be possible to transfer some cars from the District Line to lengthen the Circle Line trains.

Two prototype tube trains are at present on trial on the Piccadilly Line, equipped with underfloor motors, giving one-seventh more passenger accommodation than present Piccadilly and Central Line trains. They have "silver" aluminium body panelling with rubber suspension and fluorescent lighting.

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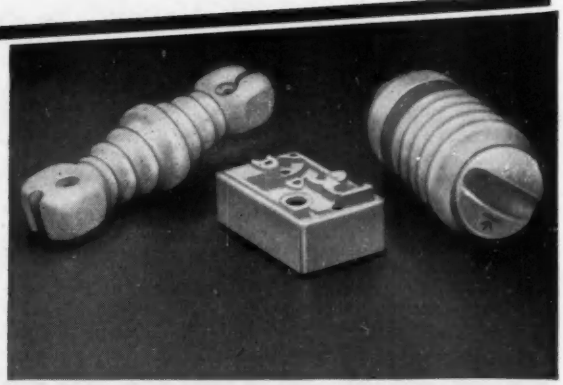

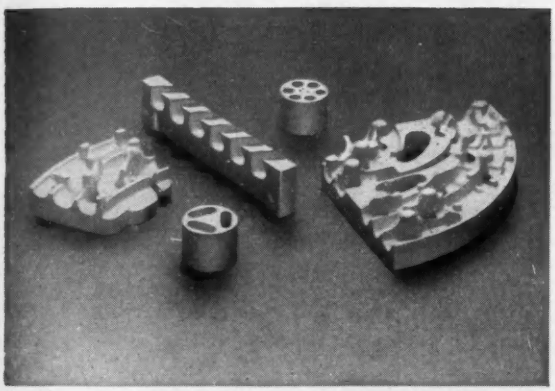

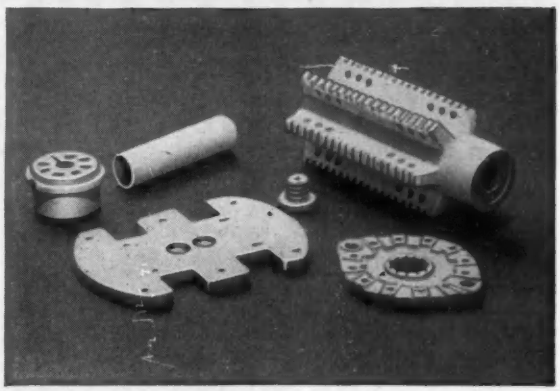

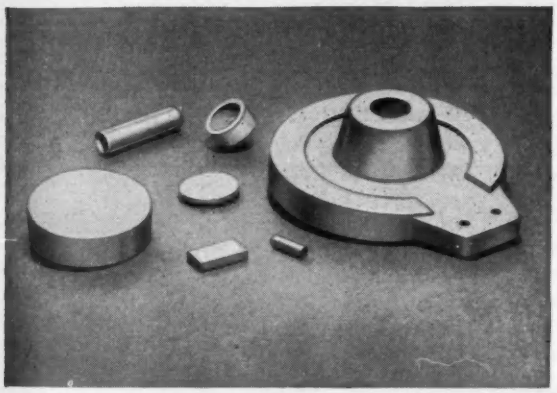

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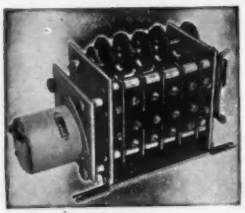

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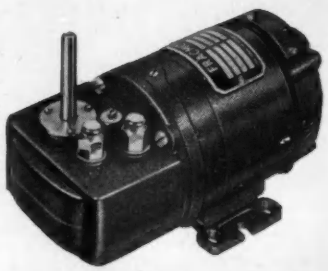

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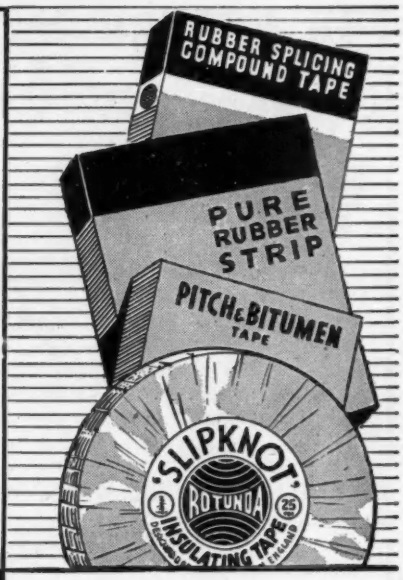

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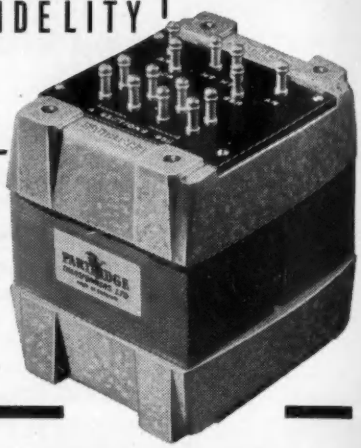

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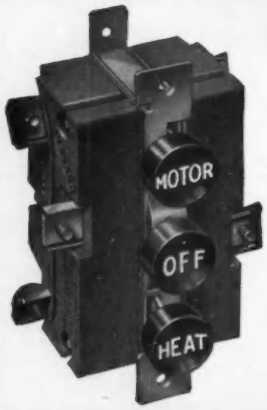

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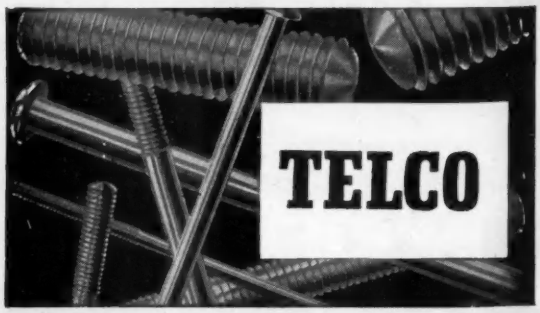

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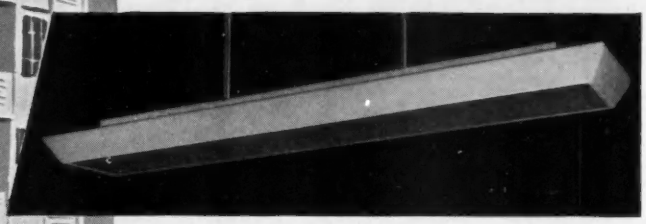

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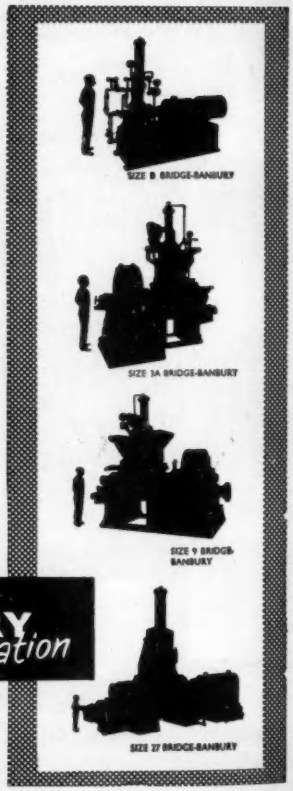

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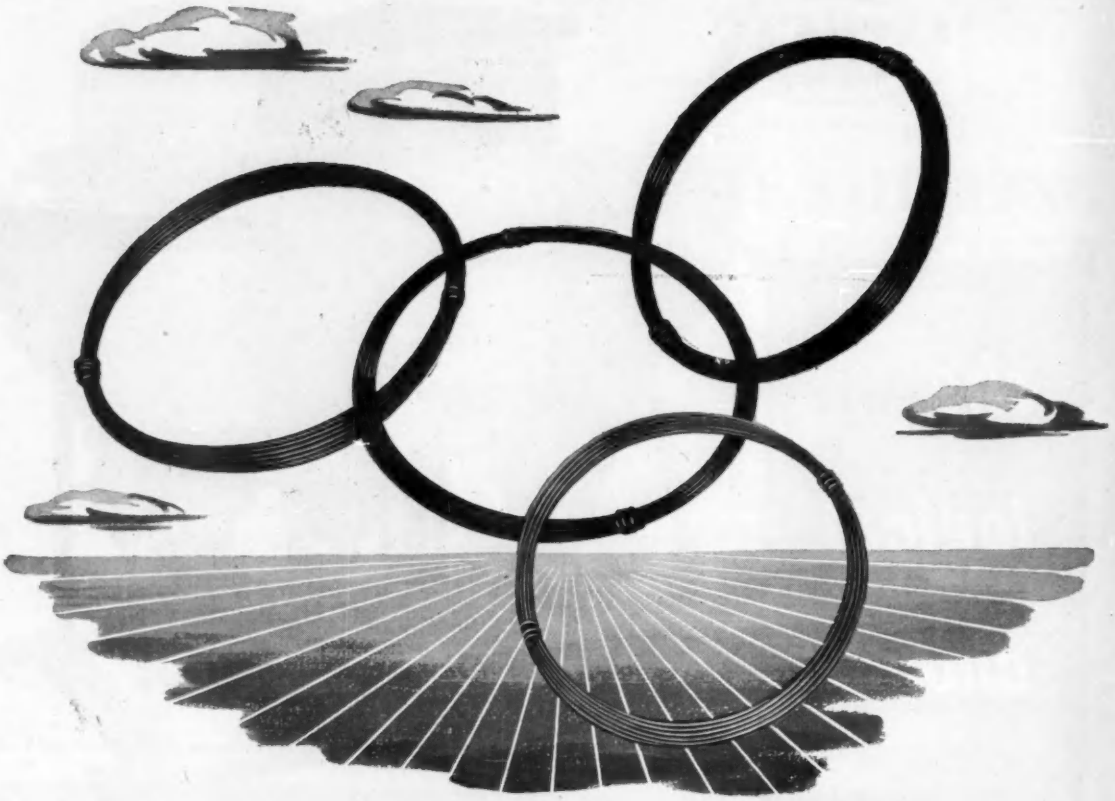

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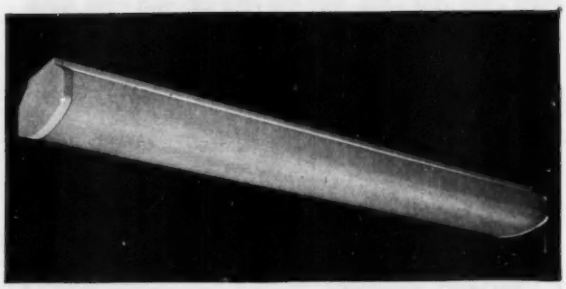

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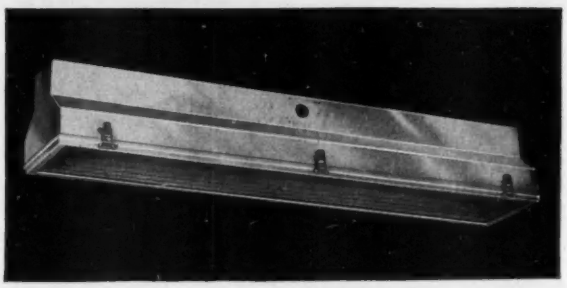

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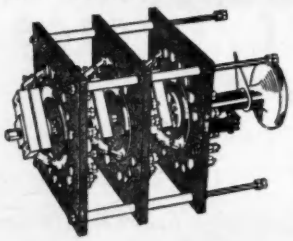

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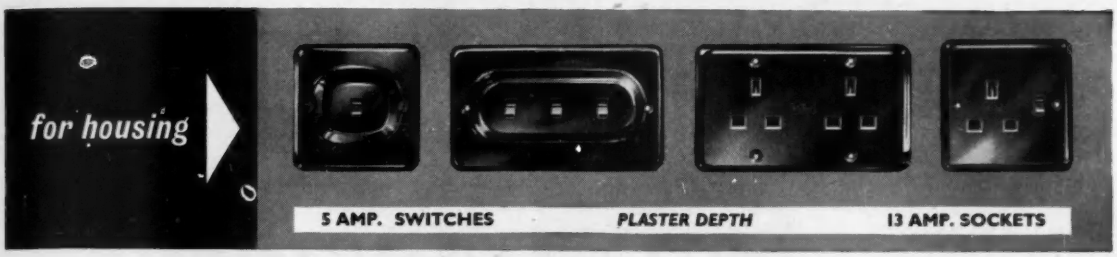

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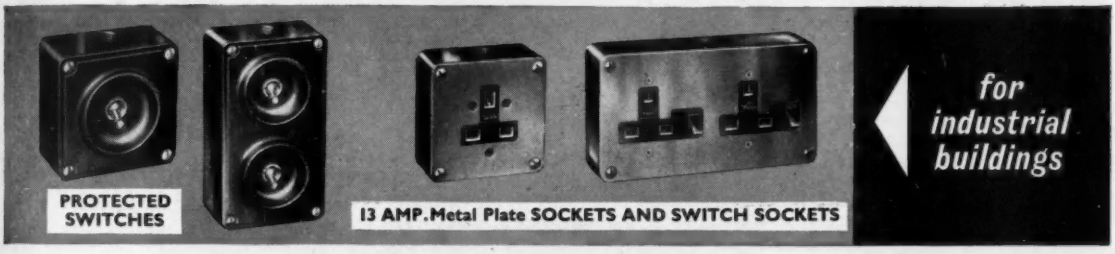
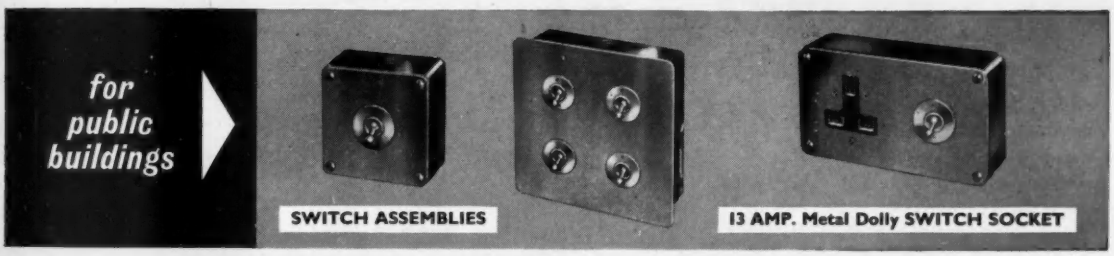
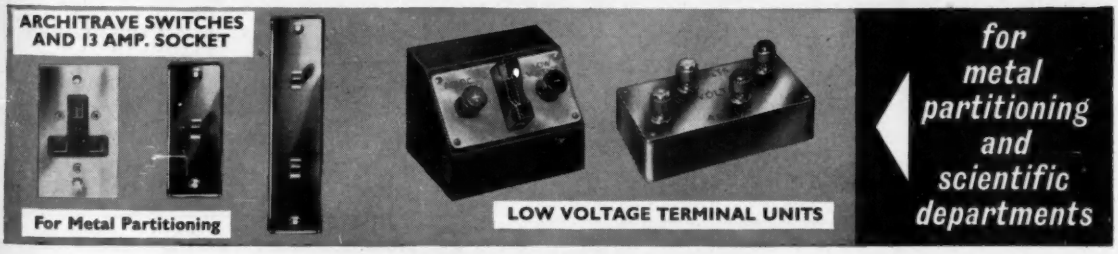


... specified by Architects and Consultants



... approved by Contractors everywhere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For Metal Partitioning
LOW VOLTAGE TERMINAL UNITS
for metal partitioning and scientific departments

For further details send for 1957/58 Edition Catalogue.

VOLEX ELECTRICAL PRODUCTS LTD.
SALFORD 6

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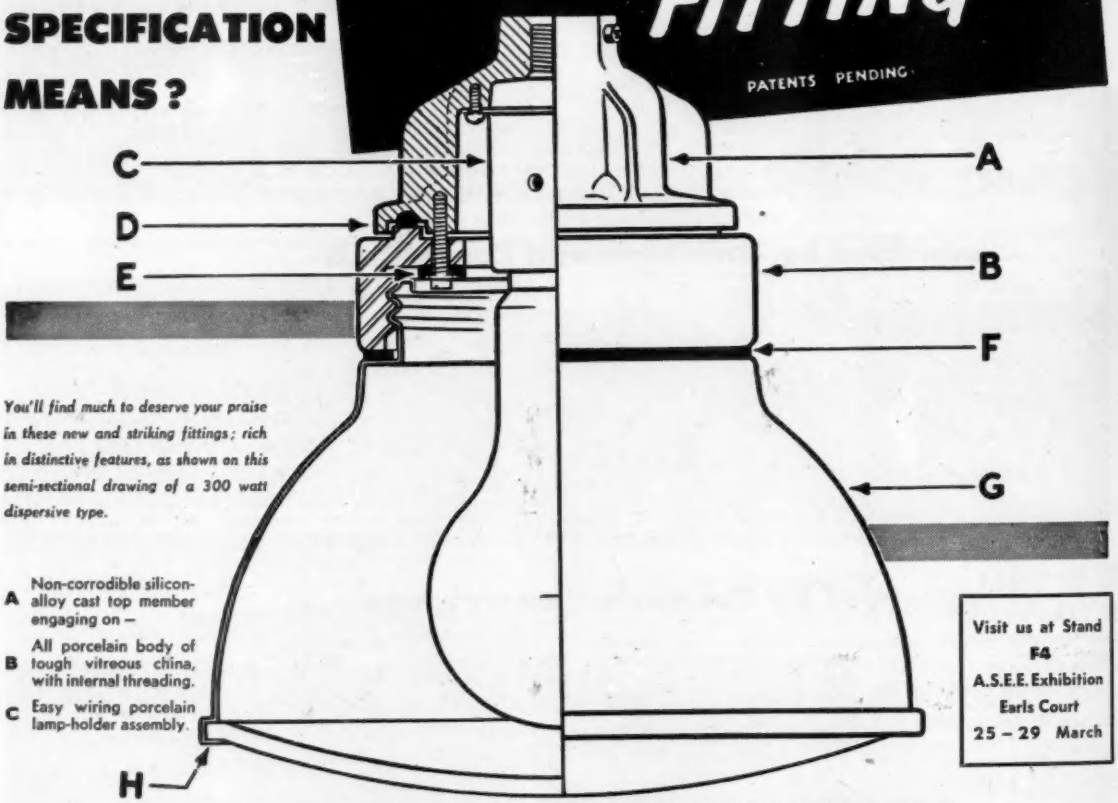
It's well worth looking into!

The R.E.A.L.

NON-CORRODIBLE 'REFLECTORTIGHT' FITTING

PATENTS PENDING

DO YOU REALISE WHAT THIS SPECIFICATION MEANS?



You'll find much to deserve your praise in these new and striking fittings; rich in distinctive features, as shown on this semi-sectional drawing of a 300 watt dispersive type.

A Non-corrodible silicon-alloy cast top member engaging on –

B All porcelain body of tough vitreous china, with internal threading.

C Easy wiring porcelain lamp-holder assembly.

D Gastight and dust-tight joint between top member and porcelain body.

E Silicon-alloy supporting ring reinforcing 3-point fixing of porcelain body to top member.

F Bonded cork gasket providing positive joint between porcelain body and –

G Screw neck reflector of heavy gauge aluminium, specially treated.

H Heavy section pressed heat-resisting glass dome, permanently sealed in position at mouth of reflector.

Visit us at Stand F4 A.S.E.E. Exhibition Earls Court 25 – 29 March

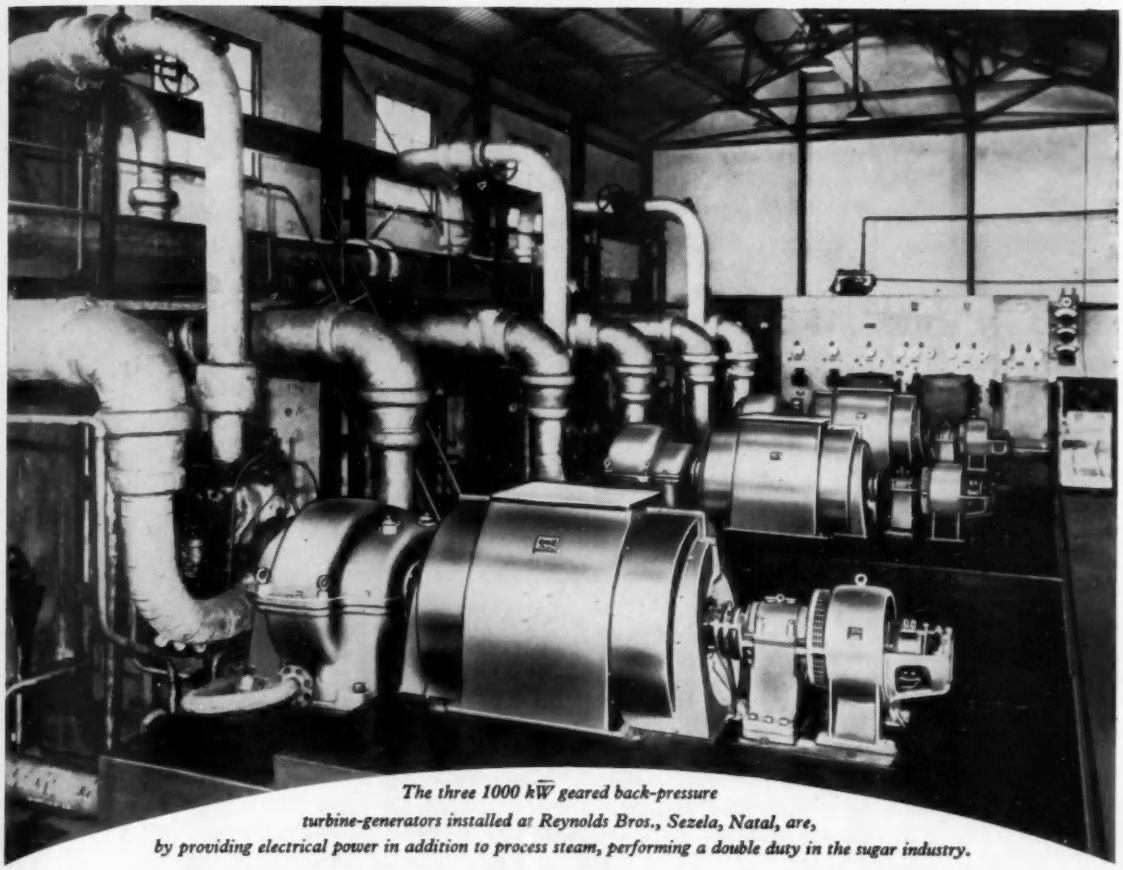
THE PRESENT RANGE OF FOUR PATTERNS

List No.	Description	Lamp Size
1090	Dispersive 10" dia.	100 watt
1093	Concentrating 8" dia.	100 watt
2000	Dispersive 12" dia.	200 watt
2010	Dispersive 12" dia.	300 watt

Publication No. P5601 gives full details of this new range

Issued by ROWLANDS ELECTRICAL ACCESSORIES LTD., R.E.A.L. WORKS, BIRMINGHAM 18

Geared Back-Pressure Turbines–



The three 1000 kW geared back-pressure turbine-generators installed at Reynolds Bros., Sezela, Natal, are, by providing electrical power in addition to process steam, performing a double duty in the sugar industry.

–cut your fuel costs

Great advantages can be gained by installing small back-pressure turbines for heating and process steam requirements in large factories. The back-pressure turbine is relatively cheap to install, occupies little space and requires only light foundations.

When Metropolitan-Vickers first installed one of their own back-pressure turbines at their Trafford Park Works in 1948 the cost of power and heating requirements for the factory were reduced by over £9,000 a year.

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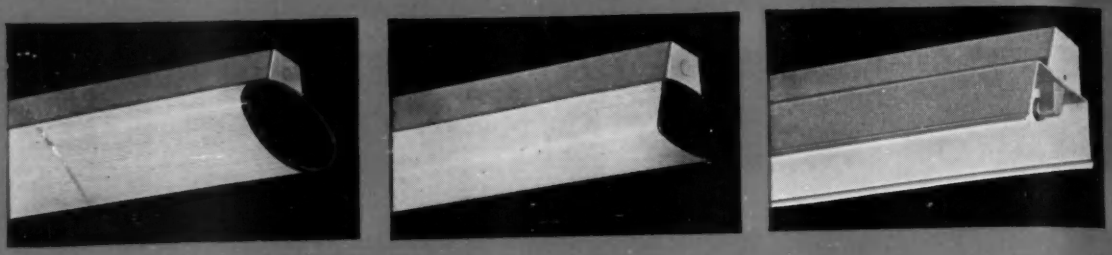
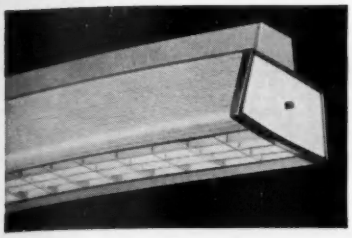
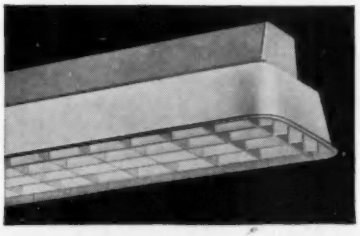
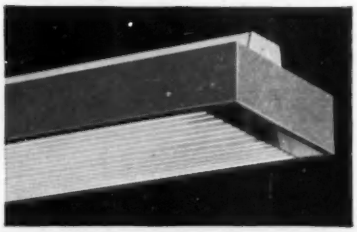


what's so new about fluorescent fittings

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.







these anyway?

Everything is new! *The '101 Range' is an entirely new range of contemporary styled industrial, commercial and decorative fluorescent fittings. The successful result, in fact, of team work between G.E.C. fittings designers and illuminating engineers. Competitively priced—outstandingly modern in conception! NEW also is the introduction of basic channels for single or twin tubes, 1½ ft. to 8 ft. which, with specially designed attachments, form an interchangeable system of great versatility with particularly simple installation and maintenance. It is important that you learn all about this exceptional range —the '101 Range'—of G.E.C. fluorescent fittings, so write for fully descriptive catalogue No. F 4068.*

new adaptability

The G.E.C. '101 Range' sets a *new standard* of adaptability. Using as a basis, channels of common cross section, industrial, commercial and decorative fittings are built without a multitude of small parts. Each is a soundly engineered fitting, of modern appearance and incorporates many aesthetic and mechanical refinements. Installation and maintenance are absolutely simple.

new reflectors

For the first time the industrial user can have vitreous enamelled closed end trough reflectors made from a single pressing, with well-rounded corners and without joints. They are therefore particularly easy to clean. New techniques enable them to be made lighter than previous types and therefore easier to handle and less susceptible to damage.

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Recessed double contact (R.D.C.) caps are fitted to OSRAM 8 ft. 125 w. tubes for use in the '101 Range'. This new cap design protects the tube ends and allows replacement by one person from one ladder position. Recessed double contact caps also provide firm, reliable support and location for these tubes without relying on contact pins or independent clips. This results in easier tube replacement after cleaning or maintenance. Unsightly shadows are reduced, as the new cap gives a smaller "dead region" at tube ends. Osram Guaranteed Tubes, with their freedom from early failures, are recommended for all G.E.C. lighting fittings.

G.E.C. range 101

Release date: 3rd February

fluorescent fittings

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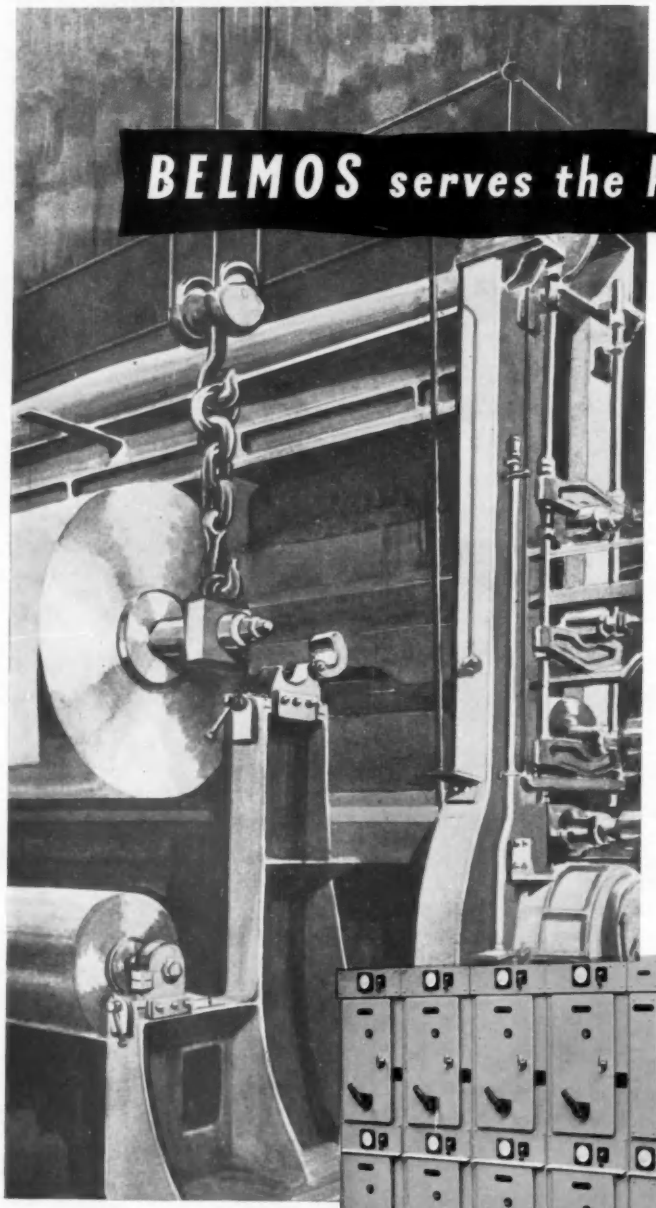

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There is little need to emphasise the part played by motor control gear in the making of paper. Belmos control gear has earned the complete confidence of plant engineer and management alike in the paper making industry throughout the world.

With over thirty years' specialist experience in the manufacture of switchgear and motor control gear, the company is justifiably proud of the part it is playing in the production of fine papers and boards.

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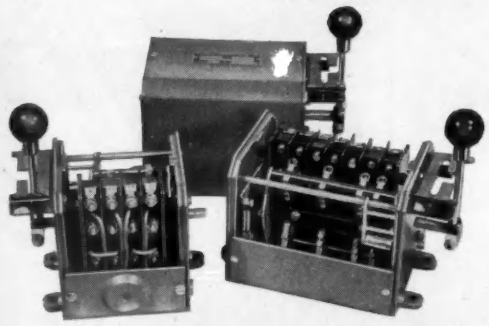
"Colne"

CONTROL SWITCHES

Capacity –
500v. 15 amps. A.C.



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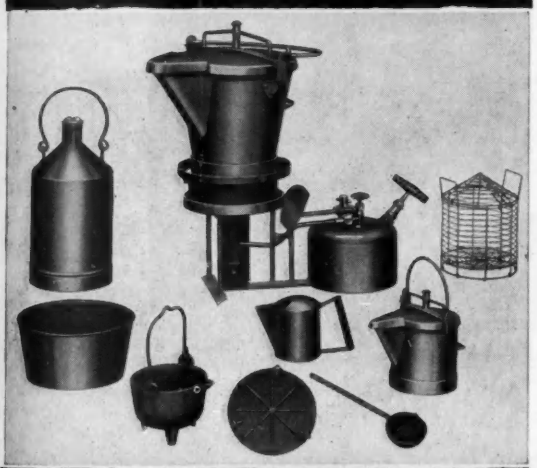

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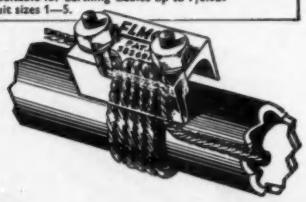
A COMPLETE RANGE TO B.S.951. 1948 IN 4 SIZES

	A123	B45	C67	D8910
for earthing cables up to	7/0.036"	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes	1, 2 & 3	4 & 5	6 & 7	8, 9 & 10
i.e. in trade terms	½" to ¾"	1" and 1¼"	1½" and 2"	2½" to 3½"

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029" and for B.S. conduit sizes 1—5.



"Elmo" Earthing Clamps are of robust construction. Impossible for wire to pull out, always under tension, therefore a most satisfactory earth and a permanent safeguard.

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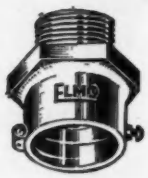
Flexible-to-rigid
CONDUIT COUPLINGS

Made in zinc base alloy in the following sizes

Electric Thread (Male)	⅜"	½"	1"	1¼"	1½"	2"
Inside Diameter	⅜"	½"	1"	1¼"	1½"	2"
Electric Thread (Male)		⅜"	½"	1"	1¼"	
Inside Diameter Flexible Conduit		½"	⅝"	¾"	1"	



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Special Features: Integral Earthing Terminal, tinned ready for soldering. Fixing screw for continuity. Internal threads suit all makes of flexible tubing.

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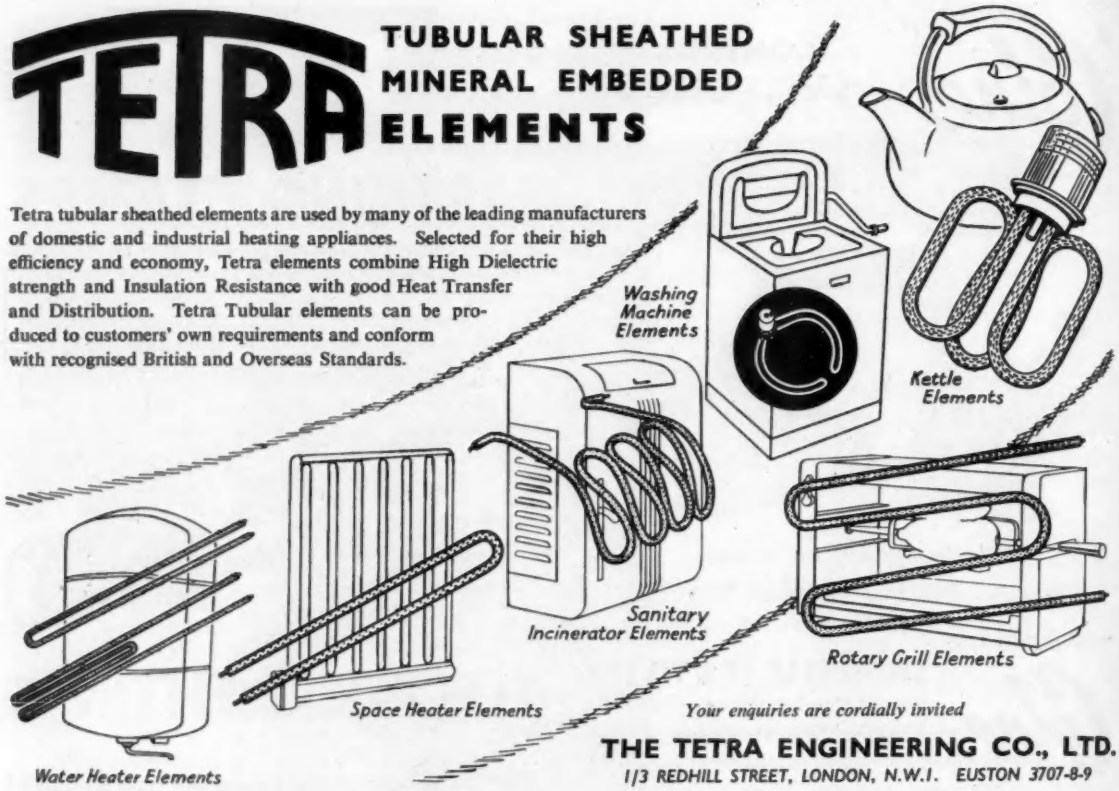

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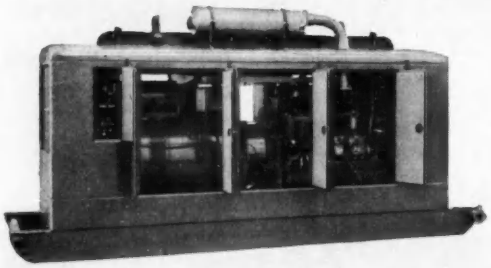

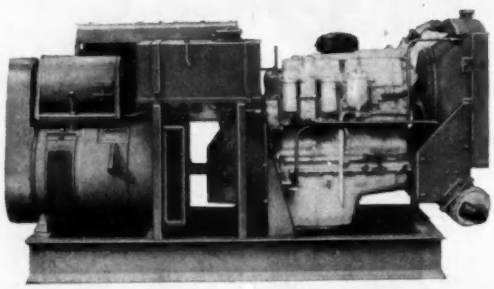

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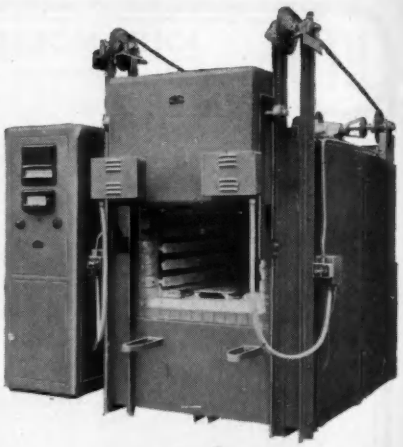
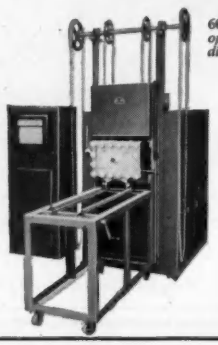


60 KW mechanically-operated model. Internal dimensions 54" x 24" x 18"



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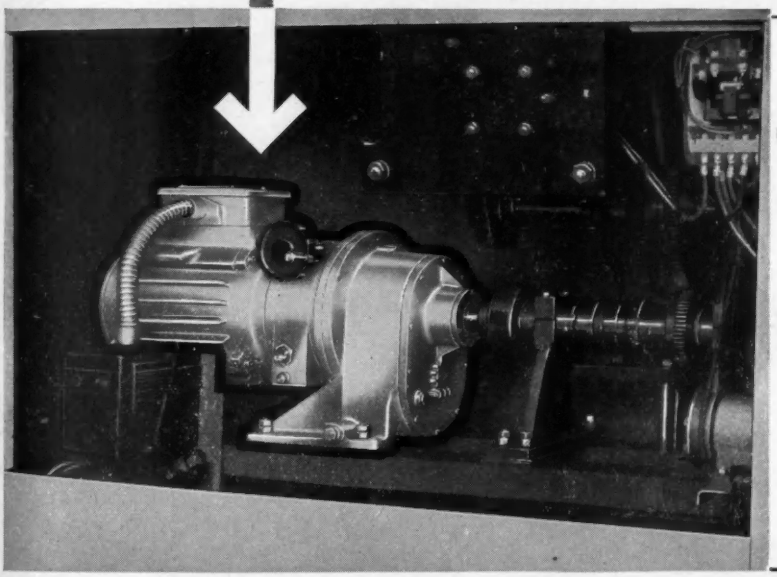

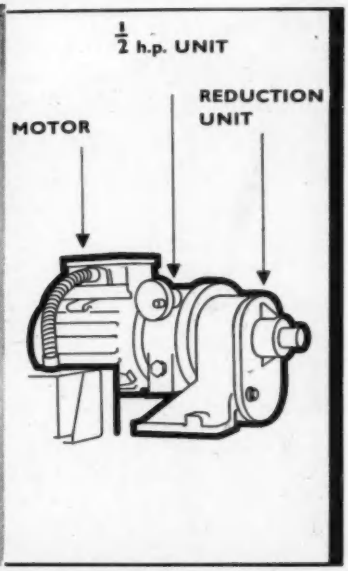

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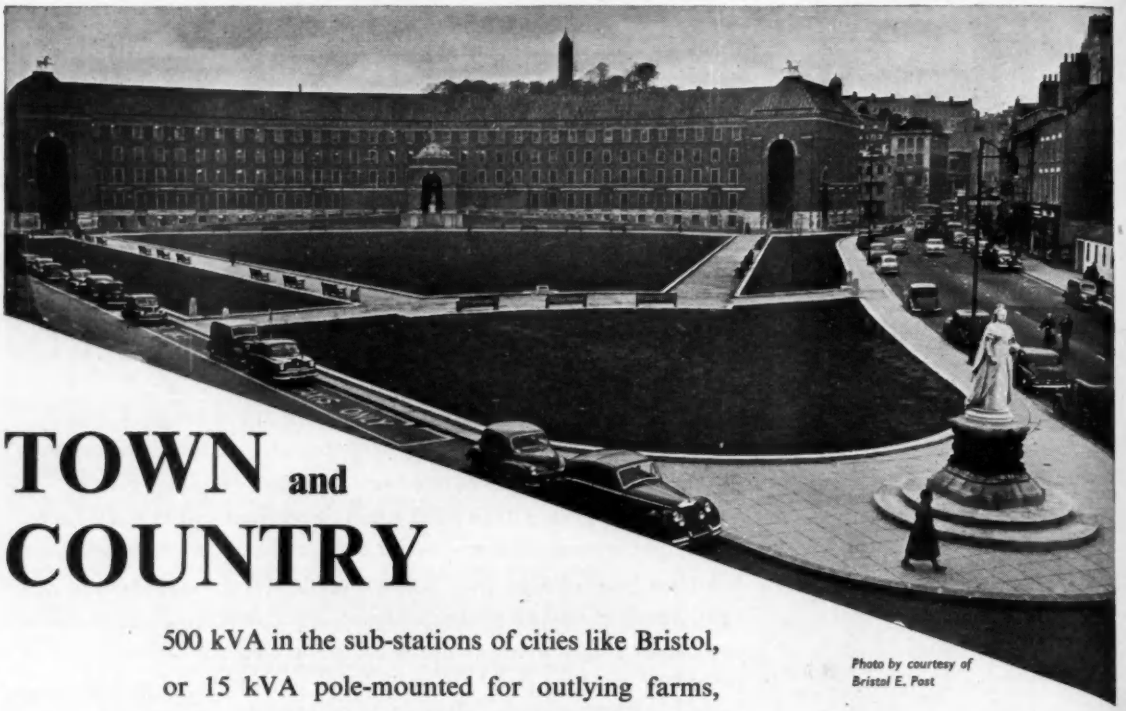
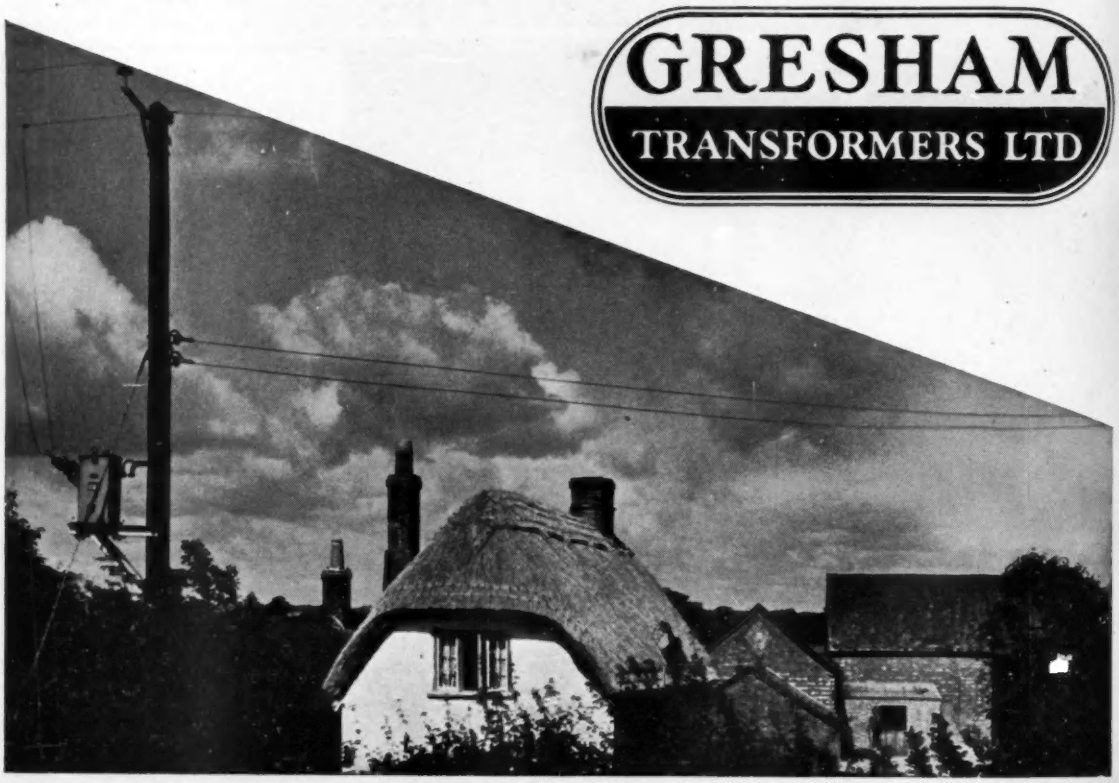


TOWN and COUNTRY

Photo by courtesy of Bristol E. Post

500 kVA in the sub-stations of cities like Bristol, or 15 kVA pole-mounted for outlying farms, Gresham Transformers are so DEPENDABLE.

GRESHAM
TRANSFORMERS LTD



GRESHAM TRANSFORMERS LTD., TWICKENHAM RD., HANWORTH, MIDDLESEX. *FELtham 2271*

THE MERITUS

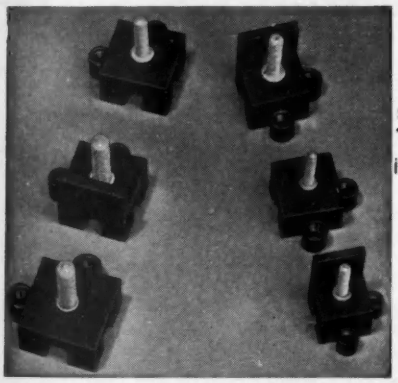
HIGH CURRENT NEUTRAL LOOP IMPEDANCE AND CONTINUITY TESTER

SHOCKPROOF AND SAFE
FOR OPERATOR AND INSTRUMENT

This instrument will SAFELY carry out tests on electrical installations and appliances as recommended in the I.E.E. Regulations, 13th Edition, 1955, Section 5.

MERITUS (BARNET) LTD.
BARNET, HERTS. Bar. 2291/2

No longer ***NEW*** *but accepted.*



Unit construction TER-MATE inter-locking terminal blocks

Patented

Repeating orders and C S A Approval confirm the adaptability of these terminals which are now available in stud sizes ranging from 4. B. A. to 5/16" moulded in bases 5/8" square to 1 1/4" with or without barriers.

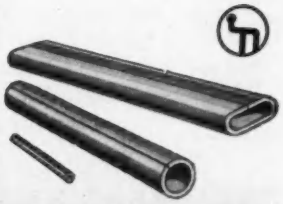
Any shape, any number of ways, anywhere, all as an integral unit, ideal for panels etc.

Samples and literature on request:—

TERMINATION EQUIPMENT CO. LTD.
NOEL WORKS, ELSON STREET, BASFORD, NOTTINGHAM
Tel.: Nottm. 76638/9

NO TIME FOR PRESSING PROBLEMS

We have, it's our business! Let Hampton Works solve your problems for you. Our claim as master craftsmen in pressings is substantiated by the variety of presswork we are asked to produce and is your assurance of complete satisfaction. We invite your enquiries.



THE HAMPTON WORKS (STAMPINGS) LIMITED

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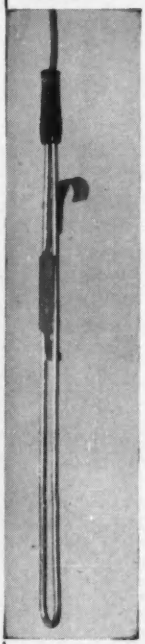
TWYNING ROAD - STIRCHLEY - BIRMINGHAM
Telephone: Kings Norton 2901 Telegrams: Radiagills Birmingham

DON'T WAIT FOR THE FROST

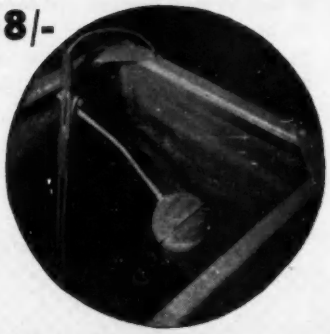


GET YOUR

ELTRON ANTI-FREEZE HEATER

NOW

PRICE
38/-



SEND FOR LEAFLET No. 956

ELTRON (LONDON) LTD.
STRATHMORE ROAD, CROYDON
Telephone: Thornton Heath 1861

Flawless

No, we shall not be silly and claim that our castings are as flawless as a piece of 16th century Venetian Glass. But we can go this far: we can say that just as the old master craftsmen got great satisfaction out of doing a job as well as it could possibly be done, so do we. That is why so many customers whose castings must have a fine skin which will readily anodise put their trust in Great Bridge Foundries

PRECISION CASTINGS IN ALUMINIUM, GUN METAL, GREY IRON, ETC. TO ALL SPECIFICATIONS

Phos. bronze and gun metal solid and cored sticks always in stock

THE GREAT BRIDGE FOUNDRY CO. LTD.

Sheepwash Lane Great Bridge - Tipton
Staffordshire Telephone TIPton 1540 and 1361

A MEMBER OF THE TRIPLEX FOUNDRIES GROUP

THE SIGN OF A GOOD CASTING

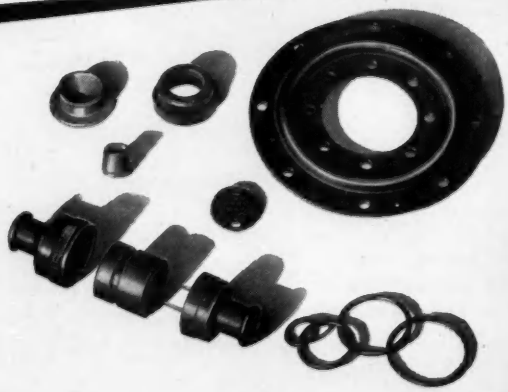
PR

Rubber Components for the more Exacting Applications

Our wide experience in the field of precision rubber engineering qualifies us to advise on the rubber compounds and design of components to meet the more exacting applications. Our plant is fully equipped to deal with bulk production as well as small quantity requirements for prototype and development work.

Designers and Engineers will be interested in our new publication, 'Synthetic and Natural Rubbers and their Uses' — copy sent upon request.

High Grade Rubber Mouldings and Extrusions · 'O' Rings Seals · Bushes · Grommets · Diaphragms · Bonded Parts and Components in Natural, Synthetic and Silicone Rubbers



Typical examples of our production

APPROVED A.I.D. AND A.R.B.

PRECISION RUBBERS LIMITED · BAGWORTH · LEICESTER · Phone: BAGWORTH 241/2/3

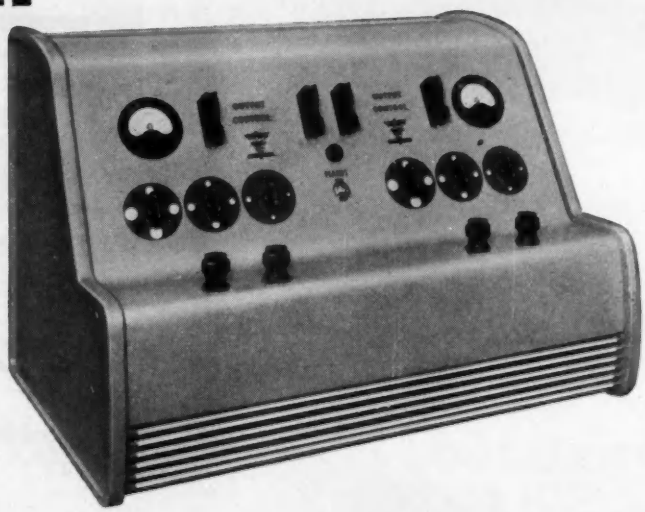
Producers of Rubber Mouldings to fine dimensional tolerances and officially approved specifications

NEW

CHARGING EQUIPMENT

for MODERN Service Stations

Model 1159. Input 200/250 volts 50 c/s. Output is two circuits. Each for 3-36 lead acid cells at 1-8 amperes with 63 step control.



Engineered for rugged service . . . designed by industrial design specialists for pleasing appearance, accessibility of switches and easy observation of instruments whether the unit is bench or wall mounted, these new chargers fit well into modern garage or factory settings. The small or large vehicle operator's requirements are covered by the range of models available.

SenTerCet
RECTIFIER EQUIPMENT
REGISTERED TRADE MARK

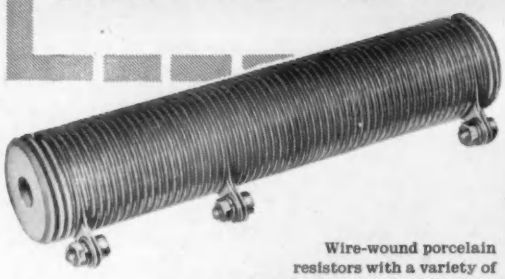
Write for leaflet.

Standard Telephones and Cables Limited

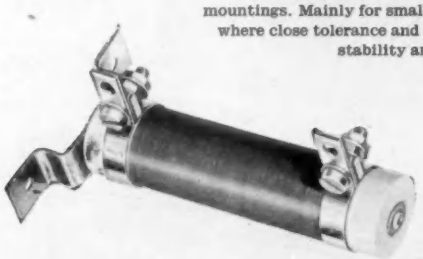
Registered Office: Connaught House, Aldwych, London, W.C.2

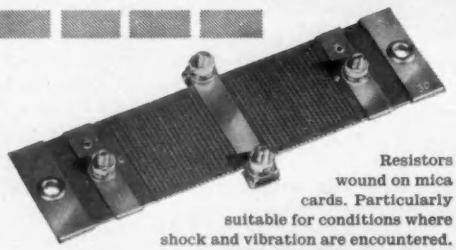
RECTIFIER DIVISION · EDINBURGH WAY · HARLOW · ESSEX

WIRE WOUND RESISTORS



Wire-wound porcelain resistors with a variety of mountings. Mainly for small loadings where close tolerance and electrical stability are needed.





Resistors wound on mica cards. Particularly suitable for conditions where shock and vibration are encountered. Easily mounted in groups for high wattage dissipation.

Made by

Cressall

THE CRESSALL MANUFACTURING COMPANY LIMITED
(A subsidiary of The Expanded Metal Co. Ltd.)
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SALES EXCEED HALF A MILLION

Up and up go the sales of the Sew-tric Sewing Machine Motor–fast-growing popularity that proves its dependability, quality and low price appeal. Get a full share of this highly satisfactory, most profitable business—send now for full details.

Sew-Tric
SEWING MACHINE MOTOR
SEW-TRIC LTD · HONEYPOT LANE · STANMORE · MIDDX.
EDGware 5261-3

Write for this Handbook

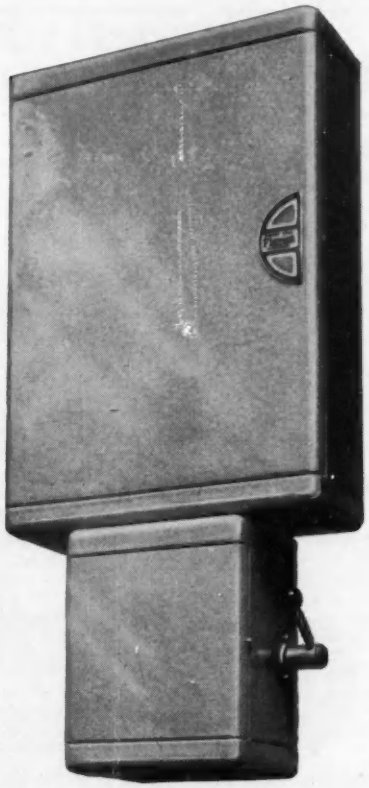
giving full technical information on the "Tophet" range of Stainless Steel Wires which we draw as fine as ·0005".

TOPHET

STAINLESS STEEL WIRES

Manufactured by **GILBY-BRUNTON LIMITED**
HEAD OFFICE & WORKS: SEAMILL, MUSSELBURGH, SCOTLAND
Telephone: Musselburgh 2369
LONDON OFFICE: 47 WHITEHALL, S.W.1. *Tel.: Whitehall 6058*

AEROFLEX
Fluvent



CABINET STYLE DISTRIBUTION BOARDS WITH ISOLATING SWITCHES

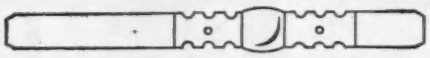
Widespread acceptance of Fluvent Cabinet Style Boards has resulted in production of a Switch of similar exterior. Intended principally for use as control switches mounted in conjunction with the boards, 30 and 60 amp. sizes are available with S.P. and neutral link as an alternative to D.P. (in the same dimensions as D.P.), and T.P. with neutral link (in the same dimensions as T.P.).

UNOBTRUSIVELY EFFICIENT

Both boards and switches have pressed steel cabinets which are cadmium plated and painted to give a grey metallic hammer finish. All edges are rounded to a uniform radius, the lid is sunk flush and the hinges invisible. Maximum accessibility is ensured by the door swing which is almost 180°.

WITH Aeroflex ENERGY LIMITING FUSES

Cabinet Style Distribution Boards are fitted with Aeroflex Energy Limiting High Breaking Capacity Cartridge Fuse Links to British Standard No. 88, 1952, 46 K.A. Breaking Capacity on 440 volts, with 1.25 fusing factor. Standard fully wired cartridge fuse links are included unless otherwise specified, when appropriate underwirings can be fitted. Fuse links are not discarded when blown — they can be returned for prompt replacement under our rewiring service scheme.



✻ *The latest type of Aeroflex fuse element as employed in the AD and FC type Energy Limiting Fuses.*

Parmiter Hope & Sugden Ltd

FLUVENT ELECTRICAL WORKS MANCHESTER 12

London: 34 Victoria Street, S.W.1. *Glasgow:* 5 Somerset Place, C.3 *Birmingham:* 39/41 Carrs Lane, 4

dm PH137

SOLDERING COMMUTATORS

AT OVER 500 PER HOUR

(An achievement by one of our customers)

FEATURE FACTS

A compact Commutator Soldering Machine which greatly speeds production and simplifies a tedious process.

FURTHER FACTS

Full technical information regarding your commutator soldering problems will be supplied on request. Our leaflet number 2A will interest you.

PROCESS HEATING Barlow-Whitney LTD

BARLOW-WHITNEY LTD., 2 DORSET SQUARE, LONDON, N.W.1 Tel.: AMBassador 5485 Works: London and Bletchley BMJ

★More and more people are using...

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ALL ELECTRIC

De-MISTER UNIT

THE SUPER CHROME FINISH ADDS TO WINDOW DISPLAY

- SUITABLE FOR A.C. OR D.C. INSTALLATION
- A PLUG-IN INSTALLATION ONLY
- VOLTAGE - 200/250v. PROVISION FOR EARTHING
- VERY LOW RUNNING COST

APPLY FOR CATALOGUES AND PRICE LISTS TO....

GRUBB ENGINEERING COMPANY LIMITED
MARY STREET • BIRMINGHAM 12

Classified Advertisements

CLASSIFIED advertisements are **PREPAID** at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF COLCHESTER

Street Lighting, Trunk Road (A.12), Cowdray Avenue, Colne Bank Avenue (part)

Group "A" Sodium Discharge Lighting

TENDERS are invited for the supply and delivery of :—

31 concrete columns with concrete bracket arms, 3′ 6″ outreach.
24 concrete columns with concrete bracket arms, 5′ outreach.
8 concrete columns with concrete bracket arms, 8′ outreach.
57 lanterns, totally enclosed (side entry), non-cut-off type.
6 lanterns, totally enclosed (top entry), full cut-off type.
63 140-watt sodium discharge lamps, complete with vacuum jackets.
63 sets of auxiliary gear for the above lamps.
63 electric time switches with spring reserve.

Copy of specification can be obtained on application to the undersigned.

Tenders in sealed envelopes endorsed "Trunk Road A.12 Lighting" to be returned to the Borough Engineer not later than noon on Monday, 3rd February, 1958.

J. S. ORCHARD, A.M.I.C.E.,
Borough Engineer.

1, West Stockwell Street,
Colchester, Essex. 1962

AYR COUNTY COUNCIL

Trunk Road Lighting

THE County Council will shortly issue separate schedules as under in connection with the installation of lighting on Trunk Road A.77 at Minishant.

1. Supply of steel standards.
2. Supply of electrical equipment.
3. Work of erection.
4. Supply of lanterns for 140-w. SO/H lamps.

Contractors to indicate to County Engineer, County Buildings, Ayr, in which contracts they are interested.

Any attempt to interlink conditionally the schedules will constitute automatic disqualification.

The County Council is not bound to accept the lowest or any offer.

IVIE McCAIG,
County Clerk. 1996

COUNTY BOROUGH OF GREAT YARMOUTH

Annual Contracts

THE Council invite tenders for the supply of Electric Cables for a period of one year from the 1st April, 1958. Specifications, forms of tender and conditions of contract may be obtained from the Borough Engineer, Town Hall, Great Yarmouth.

Tenders, on the forms supplied, in a plain sealed envelope endorsed "Tender for Electric Cables," must reach me not later than Friday, 31st January, 1958.

No guarantee is given that the lowest or any tender will be accepted.

FARRA CONWAY,
Town Clerk.

Town Hall,
Great Yarmouth.
8th January, 1958. 1983

BOROUGH OF HYTHE

Trunk Road Lighting

TENDERS are invited for the following :—

Contract A. Supply and delivery only of 45 Reinforced Concrete Lighting Columns, 9 Steel Lighting Columns and 10 Wall Brackets.

Contract B. Supply and delivery only of 64 Lanterns and Control Gear comprising 44 400-watt Mercury Discharge Lamps and 20 Colour Corrected 400-watt Lamps.

Contract C. Erection and fitting of complete equipment included in Contracts A and B and wiring complete.

Specification, bills of quantities and forms of tender for the above separate contracts may be obtained from the Borough Surveyor at the undermentioned address on payment of a deposit of £5 5s., which will be returned on receipt of a bona fide tender which is not subsequently withdrawn. Cheques to be made payable to "Hythe Corporation."

Tenders and all documents in plain sealed envelopes endorsed "Trunk Road Lighting" must be delivered to the undersigned not later than noon on 10th February, 1958.

The Corporation do not bind themselves to accept the lowest or any tender.

J. NOWELL,
Town Clerk.

Municipal Offices,
Stade Street,
Hythe, Kent. 1982

BOROUGH OF CHELTENHAM

Entertainments Committee

Town Hall: Complete Re-Wiring of the Electrical Installation

TENDERS are invited from Approved Electrical Installation Contractors for re-wiring of the Electrical Installation at the Town Hall.

Application for general conditions, specification, drawings and form of tender to be made to the undersigned, accompanied by a deposit of five guineas (made payable to the Corporation), which will be refunded on receipt of a bona fide tender not subsequently withdrawn, and all documents.

The tenders must be sent to the Town Clerk, in a plain sealed envelope marked "Tender for Electrical Installation, Town Hall," by noon on Tuesday, 25th February, 1958.

The Council does not bind itself to accept the lowest or any tender.

G. GOULD MARSLAND,
M.B.E., B.Sc.,
M.I.C.E., M.T.P.I.,
Borough Engineer.

P.O. Box No. 12,
Municipal Offices,
Cheltenham. 1992

BOROUGH OF WILLESDEN

Annual Contracts

TENDERS are invited for the supply of Electrical Equipment, Cables, Conduit and Lamps for a period of twelve months ending 31st March, 1959.

Particulars and forms of tender can be obtained from the Borough Engineer, Town Hall, Dyne Road, Kilburn, London, N.W.6, and must be returned not later than Saturday, 15th February, 1958.

R. S. FORSTER,
Town Clerk.

Town Hall,
Dyne Road, Kilburn,
London, N.W.6.
9th January, 1958. 1995

BOROUGH OF NEWBURY

East-West Relief Road: Trunk Road Lighting Scheme

TENDERS are invited for the supply and erection of 65 Lanterns and 63 Steel Columns in connection with the above scheme as follows :—

1. Provision of lighting equipment and control gear.
2 (a) The supply, delivery and erection of steel columns together with fitting and wiring of electrical equipment offered in own tender.
2 (b) The supply, delivery and erection of steel columns together with fitting and wiring of electrical equipment provided by another firm.

Form of tender, specification and bill of quantities may be obtained from the Borough Surveyor, Municipal Buildings, Newbury, at whose office plans and general conditions may be inspected.

Sealed tenders, endorsed "Tender, Lighting," must be delivered to the undersigned not later than 9 a.m. Friday, 7th February, 1958. The Corporation does not bind itself to accept the lowest or any tender.

LESLIE SOUTHERN,
Town Clerk.
1994

NORTHAMPTONSHIRE COUNTY COUNCIL

Corby Technical College

TENDERS are to be invited shortly for the second and major instalment of the college buildings near the new Town Centre at Corby, the estimated cost being between £220,000 and £240,000. Contractors wishing to tender for the electrical installation are asked to notify the County Architect, County Hall, Northampton, by Tuesday, 4th February.

From the names received the committee concerned will select firms to whom particulars will be sent.

J. ALAN TURNER,
Clerk of the County Council.

County Hall,
Northampton. 1997

FRIERN BARNET URBAN DISTRICT COUNCIL

Annual Tenders

TENDERS are invited for the supply and delivery of Street Lighting Lamps for twelve months commencing 1st April, 1958.

Specification and form of tender, etc., may be obtained from the Engineer and Surveyor, Town Hall, London, N.11.

Tenders are to be delivered to the undersigned not later than 10 a.m. on Monday, 3rd February, 1958.

EDWARD G. HUBBARD,
Clerk of the Council.

Town Hall,
London, N.11. 1993

SITUATIONS VACANT

BRITISH KLOCKNER SWITCHGEAR LIMITED

Chertsey, Surrey

TECHNICAL SALES ENGINEERS required for London and Home Counties. Knowledge of motor control gear; sales experience preferred but not essential. Apply giving full particulars to—Managing Director. 166

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following appointments in this Division :—

ASSISTANT SHIFT CHARGE ENGINEER, DRAKELOW POWER STATION
(Vacancy No. 2/58/ER).

Applicants should have suitable technical qualifications and experience in power station operation.

Salary will be within Class J, Grade 9 (£935-£995 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 22nd January, 1958.

GENERAL ASSISTANT ENGINEERS
(Chemist).

A General Assistant Engineer (Chemist) is required at the following Power Stations :—

Drakelow Power Station
(Vacancy No. 3/58/ER).
Castle Donington Power Station
(Vacancy No. 1/58/ER).

Candidates must have had a sound technical training and some previous laboratory experience and should hold the Ordinary National Certificate in Chemistry.

Salary will be within the range £540-£680 per annum in accordance with the National Joint Board Agreement.

Closing date for receipt of applications, 22nd January, 1958.

GENERAL ASSISTANT ENGINEER, AVON POWER STATION, WARWICK
(Vacancy No. 5/58/ER).

A General Assistant Engineer is required at Avon Power Station, Warwick, where the suitable applicant will be given the opportunity to obtain operating and maintenance experience at this power station.

Applicants should be in possession of suitable engineering qualifications.

Salary will be within the range £540-£680 per annum in accordance with the National Joint Board Agreement.

Closing date for receipt of applications, 29th January, 1958.

ASSISTANT SHIFT CHARGE ENGINEER, WILLINGTON POWER STATION
(Vacancy No. 4/58/ER).

Applicants should have received a sound technical training and have had experience in a modern power station.

Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class K, Grade 9 (£995 - £1,055 per annum) of the National Joint Board Agreement plus 10% allowance for shift duties.

Closing date for receipt of applications, 29th January, 1958.

SECOND ASSISTANT ENGINEER (Civil), STAYTHORPE "B" POWER STATION
(Vacancy No. 6/58/ER).

The successful applicant will be required to assist in supervising the civil engineering and building work at Staythorpe "B" Power Station in collaboration with the consulting engineers.

Preference will be given to applicants who have a degree in Civil Engineering, are Corporate Members of the Institution of Civil Engineers, or possess equivalent qualifications. They should have had experience in the administration of large civil engineering contracts and be able to supervise the setting out and progress of the works, which include heavy pile foundations, culverts, structural steelwork, buildings and the like.

Salary will be in accordance with Class AX/EX, Grade 4 (£1,145-£1,410 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 29th January, 1958.

SECOND ASSISTANT ENGINEER (Electrical), GENERATION (Construction) DEPT.
(Vacancy No. 7/58/ER).

Preference will be given to applicants who hold a degree in Electrical Engineering, are Corporate Members of the Institution of Electrical Engineers, or possess other equivalent qualifications.

They should have had experience in the design and installation of switchgear, transformers and cables up to 33 kV, and other electrical equipment associated with modern power stations.

Experience in the preparation of specifications and estimates and preparing reports on tenders will be a recommendation.

Salary will be within Class AX/EX, Grade 4 (£1,145-£1,410 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 29th January, 1958.

SHIFT CHARGE ENGINEER, WARWICK POWER STATION
(Vacancy No. 8/58/ER).

Applicants should be qualified engineers and should have had experience in the operation of steam turbine and boiler plant.

Salary will be in accordance with Class E, Grade 7 (£835-£880 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 29th January, 1958.

SENIOR DRAUGHTSMAN (Civil), GENERATION (Construction) DEPT.
(Vacancy No. 9/58/ER).

Candidates should have experience in the preparation of detail drawings and in the design of one or more of the following subjects:—

Reinforced concrete structures.
Piled and slab foundations for heavy components.
Cable subways, bridges and culverts.

Salary will be in accordance with Grade 5 (£760-£860 per annum) or Grade 4 (£895-£995 per annum) of the Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications, 29th January, 1958.

These appointments will be pensionable under the terms of the Staff Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.

8th January, 1958. 1963

A Company of
The Expert Tool Group
requires

SENIOR
DESIGNER-DRAUGHTSMEN

Applicants must have had experience in the design of contactors and relays allied to the

MOTOR CONTROL GEAR FIELD.

They should have received an engineering training and be in possession of H.N.C. or equivalent qualification.

The positions are permanent and salary will be paid commensurate with qualifications and experience.

Please write giving age, present salary and full details to:—

Chief Draughtsman,
SHARP CONTROL GEAR LTD.,
Lount Works,
Ashby-de-la-Zouch,
Leicestershire.

2015

TRANSFORMER DRAUGHTSMEN

SENIOR and JUNIOR DRAUGHTSMEN with experience on power transformers in range 5 to 10,000 kVA required. Permanent positions offering good salary according to experience. Pension, life assurance scheme, etc. Evening and Saturday interviews can be arranged. Write stating age, experience and qualifications to :—

The Chief Engineer
BRYCE ELECTRIC CONSTRUCTION CO. LTD.
Kelvin Works, Hackbridge, Wallington, Surrey

1915

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Worcester and District Sub-Area

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER
(Kidderminster District).

Applicants should have had a sound technical training and experience in the preparation of specifications and tenders for lighting, heating and power installations in domestic, commercial, industrial and agricultural premises, together with experience of sales promotion and advice to consumers. Technical qualifications desirable. Salary £935/£995 per annum (N.J.B. Grade F.6).

SECOND ASSISTANT DISTRICT ENGINEER
(Banbury District).

Applicants should have had experience in the planning, construction, operation and maintenance of medium and high voltage distribution systems, including reinforcements and extensions. Technical qualifications desirable. Salary £835/£880 per annum (N.J.B. Grade E.7).

Apply by letter, within fourteen days, stating age, qualifications, experience, present position and salary to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER
(Redditch/Bromsgrove District).

Responsibilities will include contracting, and electrical apparatus, radio, T.V. and refrigeration repairs. Applicants should have had experience in estimating for all classes of electrical installation work, the preparation of tenders and specifications. A sound knowledge of installation practice with good commercial ability is necessary. Technical qualifications desirable. Salary £835/£880 per annum (N.J.B. Grade F.8).

Apply by letter, within seven days, stating age, qualifications, experience, present position and salary to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

North Staffordshire Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER
(Stone/Market Drayton District).

Applicants should have experience in the planning, construction, operation and maintenance of medium and high voltage distribution systems, including reinforcements and extensions. Technical qualifications desirable. Salary £835/£880 per annum (N.J.B. Grade E.7).

Apply by letter, giving full personal details and experience, to Mr. H. A. P. Caddell, Sub-Area Manager, Midlands Electricity Board, P.O. Box No. 4, 234, Victoria Road, Fenton, Stoke-on-Trent.

Shropshire and Herefordshire Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER
(Hereford District).

Applicants will be required to assist in the planning, construction and maintenance of H.V./L.V. overhead and underground cables. Technical qualifications desirable. Salary £635/£680 per annum (N.J.B. Grade E.11).

Apply by letter, within fourteen days, stating age, experience, present salary and position to Mr. W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

A. STEPHENS,
Secretary.

2000

Our
OVERSEAS ENGINEERING DEPARTMENT
require an
ELECTRICAL ASSISTANT

to work on complete factory installation and control schemes associated with new and existing overseas factories. Preference will be given to applicants with experience of H.T. and L.T. switchgear layouts, A.C. and D.C. motor control schemes and lighting installations. Minimum qualification required O.N.C. (Electrical).

Please write, giving age, experience and salary required, to:—

Personnel Manager (OE),
DUNLOP RUBBER CO. LTD.,
Fort Dunlop,
Erdington, Birmingham, 24.

2013

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Local)

Swindon District of No. 2 (Newbury) Sub-Area, located at Cirencester. Salary N.J.B. Grade 11, Class F (£685-£730 per annum). N.J.B. conditions of service.

Applicants should have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and distribution equipment, and possess suitable technical qualifications. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, and returned to him in envelopes suitably endorsed, not later than 27th January, 1958.

Field Engineer (Construction)

North Sub-Section, Sub-Area Engineering Department, Farnborough, No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class K, Grade 13 (£790 × £15 to £835 per annum). N.J.B. conditions of service.

The duties of the post will be to carry out the installation and erection of plant, equipment and overhead lines, the laying of cables and other constructional work on all distribution systems up to and including 33 kV.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed, not later than 27th January, 1958.

Demonstrator

Ealing District of No. 1 (Southall) Sub-Area. Salary N.J.C. Grade 1 (£500-£600 per annum, plus £40 London weighting). N.J.C. conditions of service.

Applicants should be qualified to advise generally on the utilisation of electric domestic appliances, to give public demonstrations of apparatus and to assist in showroom duties. The possession of an E.A.W. Certificate or equivalent domestic science qualification would be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, 2/6, Windmill Lane, Southall, Middlesex, and returned to him in envelopes suitably endorsed, not later than 27th January, 1958.

The successful candidates for the above appointments will be required to contribute to the C.E.A. and Area Boards (Staff) superannuation scheme, if eligible. 2006

BOROUGH POLYTECHNIC

Borough Road, London, S.E.1

Principal: James E. Garside, M.Sc.Tech., Ph.D., F.R.I.C., F.I.M., M.Inst.F.

APPLICATIONS are invited for the following appointments :—

DEPARTMENT OF ELECTRICAL ENGINEERING AND PHYSICS.

Head of Department :
V. Pereira-Mendoza, M.Sc.Tech., M.I.E.E.

LECTURER IN ELECTRICAL ENGINEERING.

Applicants should be University Graduates and/or Chartered Electrical Engineers. Responsible industrial and/or teaching experience in "heavy" electrical engineering is essential. Courses involved include those for Dip.Tech. in Electrical Engineering, Higher National Diploma, Higher National Certificate, and courses in preparation for Part III of the I.E.E. examinations.

ASSISTANT LECTURER (Grade B) in ELECTRICAL ENGINEERING.

Applicants should be University Graduates and/or Chartered Electrical Engineers. Industrial and/or teaching experience in "heavy" electrical engineering is essential. Duties primarily concerned with Higher National Diploma and National Certificate courses, but participation in Dip.Tech. courses are possible for a suitably qualified candidate.

Salary scales :—

Lecturer £1,200 × £30 to £1,350 p.a. plus London allowance.

Assistant Lecturer (Grade B) £650 × £25 to £1,025 p.a. plus London allowance and allowances for degrees and training.

Further particulars and form of application from the undersigned.

FREDK. J. PACKER,
Clerk to the Governing Body.
1936

COUNTY BOROUGH OF STOCKPORT

ELECTRICAL ENGINEER required, APT. III (£845-£1,025) or Special Grade (£750-£1,030) according to qualifications, commencing according to experience. Duties will include advising on design, specifications, installation, maintenance, etc., of electrical installations for all corporation properties.

Full particulars (age, qualifications, experience, two referees) to Borough Architect, Town Hall, Stockport, by 31st January, 1958.

Post pensionable, subject to medical examination.

Canvassing disqualifies. Applicants must state if related to any member/senior officer of Council. 2035

ELECTRICAL ENGINEERS FOR CANADA

A PUBLICLY owned utility engaged in the generation, transmission and distribution of electrical energy in Saskatchewan has vacancies for three Electrical Engineers with headquarters in Regina. Successful applicants must hold Graduate or Corporate Membership in the Institution of Electrical Engineers and have a minimum of your years' practical experience in one of the fields described below. They must be less than 36 years of age.

Two of the appointments will be in the field of station electrical design. Appointees will be required to carry out the following work with minimum supervision : design and supervise electrical installation in generating stations of an ultimate capacity of 400 megawatts in stages of 66 to 100 megawatts per unit ; design and supervise construction of electrical substations up to 138 kV. Applicants must be competent to undertake the commissioning of the substations without supervision, including the work of installation and testing of differential, distance and pilot wire relays.

One appointment will be in the field of Electrical Protection Engineering. Appointee will be required to carry out fault current calculations mathematically and on a D.C. analogue board ; to write specifications for relay and instrument transformer requirements ; to set up and analyse records of relay performance in the field of differential relaying, high-speed distance relaying with carrier inter-trip, pilot wire relaying.

Starting salaries for Station Design Engineer position will be $460 per month rising by increments to $555 per month in two years. Employee benefits include contributory superannuation, three weeks' paid holidays per year, etc. Salary for Protection Engineer position will be equal or higher depending on experience of successful applicant.

Selected applicants will be required to undergo a personnel evaluation by a management consultant situated in London, England. The consultant's fee and the travelling expenses to and from London of those applicants chosen for this interview will be paid by the advertiser. Offers of employment will be conditional on reporting for duty within a very short time after the offer is made.

Application forms may be obtained by contacting—

The Agent-General for Saskatchewan,
28, Chester Street,
London, S.W.1.

2010

NATIONAL COAL BOARD

SENIOR ENGINEERING DRAUGHTSMEN (2), with good knowledge of power generating plant, and preferably H.N.C. or equivalent, required in London (Victoria district). Starting salary depending on experience, etc., but not less than £840 and rising to £1,120. Excellent career prospects. 5-day week, superannuation, canteen, etc.

Write with full particulars to National Coal Board, Staff Dept. (X946/3B), Hobart House, London, S.W.1, before 31st January, 1958. 1986

SOUTH EASTERN ELECTRICITY BOARD

CARTOGRAPHIC DRAUGHTSMAN (Male), West Kent District.

Salary £615 × £20 to £675 per annum under N.J.C. Grade 2, plus London weighting. Superannuable.

Applicants must have had sound experience of drawing office work, preparation of high-voltage and low-voltage mains records, reproduction of ordnance survey maps.

Applications on forms from Mr. H. C. Poore, West Kent District Manager, SEEBOARD, 270, High street, Orpington, Kent, by 29th January, 1958.

ASSISTANT DISTRICT ENGINEER, Folkestone and Ashford District.

Salary £790 × £15 to £835 per annum under N.J.B. Class F, Grade 9. Superannuable.

Applicants, of good general education, should be technically trained preferably to Higher National Certificate standard in Electrical Engineering. They should have practical experience in the operation, maintenance and construction of underground and overhead distribution systems up to and including 11 kV. The appointment will involve standby duty.

Applications, naming two referees, to D. B. R. Roberts, A.I.E.E., Manager, Folkestone and Ashford District, SEEBOARD, York House, Cheriton Gardens, Folkestone, by 29th January, 1958.

ASSISTANT (District Senior Clerk's Dept.), responsible for Consumers' Service Section, Dorking and Epsom District.

Salary £690 × £20 to £750 per annum under Grade 3 of the N.J.C. Agreement. Superannuable.

Duties include dealing with applications for supply, service enquiries and quotations, consumers' records and all ancillary matters. Applicants should have considerable experience of the work involved, be able to deal with correspondence and the supervision of staff. 38-hour week with alternate Saturdays free ; generous leave and sick pay scheme.

Applications, naming two referees, on forms from C. L. B. White, District Manager, SEEBOARD, 56, South Street, Dorking, by 29th January, 1958.

SENIOR DRAUGHTSMAN, Woking District.

Salary £760 to £860 per annum under N.J.B. Schedule D, Grade 5. Superannuable.

Applicants should be fully trained engineering draughtsmen with a knowledge of record systems and capable of supervising a district drawing office.

Applications, naming two referees, on forms from E. Peel, A.M.I.E.E., Woking Manager, SEEBOARD, 4, Chobham Road, Woking, by 29th January, 1958.

A. L. BURNELL,
Secretary. 2007

'ENGLISH ELECTRIC'

PROFESSIONAL Engineering appointments are available with this Group on a range of manufacturing, design and application engineering duties on all classes of electrical equipment and on hydro-electric work. Experience in electrical manufacture and power generation equipment is the qualification sought, and professional engineers in any of these fields are invited to apply for consideration.

A number of vacancies also exist for trained engineers seeking an opportunity of acquiring further experience and scope in this class of work, and particularly for Transformer and Switchgear Engineers.

All appointments are pensionable after a short qualifying period.

Apply stating age, experience and qualifications to Dept. C.P.S., 336/7, Strand, London, W.C.2, quoting Ref. ER.418D.

1912

Situations Vacant (continued)

HERTFORDSHIRE COUNTY COUNCIL

County Architect's Department

ELECTRICAL ENGINEER required. Salary Grade IV (£1,025-£1,175). Applicants should possess H.N.C. in Electrical Engineering and be able to prepare detailed schemes and specifications for schools and other public buildings.

Applications, with particulars of qualifications and experience, and names of three referees, to County Architect, County Hall, Hertford, Herts., by 27th January, 1958. 1987

ENGLISH ELECTRIC

FUSEGEAR DIVISION

who manufacture a wide range of switchboards and distribution equipment incorporating H.R.C. fuses, have a limited number of vacancies for

SALES AND CONTRACTS ENGINEERS

at their Liverpool works. These positions are pensionable after a qualifying period and offer excellent opportunities for promotion and advancement to keen young engineers interested in making a career with the company.

Outside Representatives for both Home and Overseas Branches are appointed from the inside staff from time to time after completion of training, and applicants would be eligible for consideration after an initial period of not less than 3 years.

Qualifications required are H.N.C. or equivalent plus sound practical training and experience in (a) electricity supply or (b) industry.

Applications will also be considered from engineers who are at present in the final year of study for H.N.C.

Write giving full details to—

Dept. C.P.S.

336/7, Strand, London, W.C.2

quoting

Ref. ER.401L.

358

DORMAN & SMITH LIMITED

ASSISTANT MANAGER required for miniature circuit breaker division. Age 25/35. H.N.C. or Degree in Engineering. Activities of a technical and supervisory nature will require initiative. Salary in accordance with ability and experience.

Apply in writing to the Secretary, Dorman & Smith Ltd., Manchester, 5. 1955

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. for posts (a) and Corporate Membership for post (b) an advantage.

(a) SHIFT CHARGE ENGINEER, BARNES POWER STATION (Vacancy No. 58/21).

Candidates should have received sound electrical or mechanical training with practical experience of operation and maintenance of turbines, boilers and rotary converters. Salary Class C, Grade 7 = £780 plus £74 shift p.a.

(a) SHIFT CHARGE ENGINEER, TAYLORS LANE POWER STATION (Vacancy No. 58/22).

Considerable experience necessary in operation of modern power station. Character and ability to deal with staff problems important. Salary Class F, Grade 7 = £935 plus £88 10s. shift p.a.

(b) SHIFT CHARGE ENGINEER, WEST HAM POWER STATION (Vacancy No. 58/23).

Candidates should have had a sound technical training in electrical and mechanical engineering. Practical experience in operation and maintenance of modern generating plant necessary, together with character and ability to supervise staff. Salary Class H, Grade 7 = £1,045 plus £99 10s. shift p.a.

(a) STATION SHIFT CONTROL ENGINEER, WEST HAM POWER STATION (Vacancy No. 58/24).

Candidates should have a sound technical training and practical experience in control and operation of steam generating plant and main switchgear in modern power station. Salary Class H, Grade 10 = £885 plus £83 10s. shift p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 27th January, 1958. 1985

ELECTRICAL ENGINEERS

required for Technical Estimating Department of Automatic Motor Control Gear Makers in West Midlands, following further expansion.

The work comprises the initial engineering of control schemes, the calculation of their cost, and the preparation of tenders.

A pension scheme is in operation and assistance towards removal expenses will be paid in approved cases.

Apply in confidence, stating age, experience and salary required, to— Box 362.

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

Wear Sub-Area

THIRD ASSISTANT ENGINEER with location at Chester-le-Street District Headquarters, Philadelphia. Applicants should have considerable experience in erection of H.V. and L.V. overhead lines, must be familiar with ordering and assembling of all materials required and be capable of taking charge of construction gangs in the field.

Salary Schedule A, Class L, Grade 10, £995/£1,055. N.J.B. conditions of service.

Tees Sub-Area

DISTRICT COMMERCIAL ENGINEER with location at Darlington. Applicants should have suitable technical qualifications and commercial experience.

Salary Schedule A, Class F, Grade 3, £1,160/£1,235. N.J.B. conditions of service.

Applications, stating age, qualifications and experience, to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 2011

SOUTH OF SCOTLAND ELECTRICITY BOARD

Glasgow Area

Third Assistant Engineer (Construction)

APPLICATIONS are invited to fill the above vacancy.

Applicants should have considerable experience in preparing specifications and estimating for power, heating and lighting installations.

The successful candidate will have charge of the electrical and mechanical workshops and experience in workshop practice and the maintenance of domestic appliances is desirable.

Possession of the Higher National Certificate or equivalent qualification would be an advantage.

The conditions of service will be in accordance with the National Joint Board Agreement for the Electricity Supply Industry. The present classification and grading is Schedule A of that agreement and the salary is on Grade L10, £995-£1,055 per annum.

The position is superannuable.

Applications on the appropriate form, which may be obtained from the undersigned, should be completed and returned within fourteen days of the appearance of this notice.

A. KELSO,
Manager.

P.O. Box 6,
75, Waterloo Street,
Glasgow, C.2.
9th January, 1958. 2005

Applications for employment are invited for the following vacancies by

FIRST ELECTRIC CORPORATION OF JOHANNESBURG, SOUTH AFRICA

1. A SENIOR DESIGN ENGINEER is required to take charge of a general engineering department. The work will involve the engineering of composite schemes covering motors, switchgear, transformers, control gear, etc., and the co-ordination of the general handling of the contracts in the works. Previous experience of this type of work is required, and the position is permanent and pensionable.

2. ESTIMATOR with experience in electrical manufacture, preferably in motor, transformer or switchgear. Design experience a recommendation. This is a senior position and offers good prospects to suitable candidate.

3. CONTROL GEAR ENGINEER required with sound experience in design and application of motor control gear 1 to 2,000 h.p. The work is interesting and varied, involving pre-estimate design and contracts engineering of switchgear projects. Previous experience essential, offering good prospects, starting salary and excellent working conditions.

Selective candidates are offered a three-year contract with sea or air passage for himself and family. Medical and pension funds available.

Apply in the first instance, giving full particulars age, experience, etc., to EGE, Crown House, Aldwych, London, W.C.2.

1828

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

Vacancies for Charge Engineers

THE TRINIDAD AND TOBAGO ELECTRICITY COMMISSION has vacancies for CHARGE ENGINEERS at its Generating Stations at Port-of-Spain and Penal.

Applicants should have experience in the operation of modern steam turbines, water tube boilers and diesel generators, and must have Graduate Membership of the I.E.E. or I.Mech.E. or Associate Membership of the I.Mar.E., or the Higher National Certificate in Mechanical Engineering or Second Engineer's M.O.T. Diesel and Steam Certificate or R.N. equivalent.

The annual salary is £1,247 10s. rising by annual increments of £37 10s. to £1,360.

A partly furnished house will be provided at a rent of £10 8s. 4d. per month plus a small extra charge for heavy furniture.

An outfit allowance of £60 is paid on arrival in Trinidad.

First class passages to Trinidad will be provided for the successful applicant, his wife and two children up to the age of eighteen. First class leave passages to the United Kingdom will be provided every three years.

There is a superannuation scheme similar to the C.E.A. and Area Board's Scheme.

Information on Trinidad can be obtained from the West India Committee, 40, Norfolk Street, London, W.C.2.

Applications giving full details of qualifications, age, experience, etc., together with two recent testimonials, should be sent by air mail to reach the General Manager, Trinidad and Tobago Electricity Commission, P.O. Box 121, Port-of-Spain, Trinidad, B.W.I., by 28th February, 1958. 1968

MICHELIN TYRE CO. LTD.

Stoke-on-Trent

have progressive openings for

DESIGNER/DRAUGHTSMEN

with H.N.C. (electrical), or O.N.C. and now studying for H.N.C., for interesting work on motor applications, lighting schemes and general factory electrical services.

Good commencing salaries, related to qualifications and experience, are offered plus a contributory pension scheme, free life assurance and excellent welfare facilities.

ASSISTANCE WITH HOUSING WILL BE GIVEN IF REQUIRED.

Please write in confidence to :—

Mr. J. E. Glendenning

c/o above

quoting reference B1/ER.

1970

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

Brighton "B" Power Station

ASSISTANT SHIFT CHARGE ENGINEER, experience of operation of power station plant is necessary and possession of H.N.C. preferred.

Salary Class K, Grade 9, £995-£1,055 per annum, plus 10% shift allowance.

Applications, giving details of education, age, present position, experience, etc., should be sent to the Station Superintendent, Brighton "B" Power Station, Portslade-by-Sea, Sussex, so as to arrive by 25th January, 1958, quoting reference 205. 2001

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

ASSISTANT ENGINEER (Electrical) required at Hayle Power Station.

Superannuatioin scheme. Salary N.J.B. Class F, Grade 10, £740 × £15 to £785.

Vacancy Number 816/58. Closing date 24th January, 1958.

Applicants should have previous experience in electrical maintenance at power stations on H.V. and L.V. switchgear, motors, remote control and relay protective equipment.

Candidates should possess a Higher National Certificate in Electrical Engineering or its equivalent.

SECOND ASSISTANT STATION CHEMIST required at Portishead A and B Power Stations.

Superannuation scheme. Salary N.J.B. Class L. Grade 11, £935 × £20 to £995.

Vacancy Number 815/58. Closing date 28th January, 1958.

Candidates must have at least a Higher National Certificate in Chemistry and a thorough knowledge of the chemical control of L.P. and H.P. power plant, with ability to control junior staff. Participation in plant problems and investigation will be required, including those related to oil firing conversion.

Previous applications for Vacancy No. 753/57 will be considered.

Applications on Form A.E.6/ACT obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by the date stated. Please quote vacancy number. 2004

RECTIFIER ENGINEERING

ENGLISH ELECTRIC STAFFORD

THE company wishes to expand the various activities of this department in the near future.

With a variety of interesting applications, including traction, rolling mill and the electro-chemical industries, this work provides an unusual opportunity to gain wide experience in all these uses of D.C. power and control systems.

Engineers with experience in the development or application of Mercury Arc, Germanium and Silicon type units are invited to apply. There are also openings for qualified Electrical Engineers who are interested, but have no prior experience of this work. In addition there are opportunities for younger, lesser qualified men in a Trainee capacity. Facilities for part-time evening study in Stafford are good.

These openings range from senior monthly staff appointments to permanent weekly staff positions.

The question of assistance with accommodation will be discussed at interview.

If you are interested please write giving full details to Dept. C.P.S., Marconi House, 336/7, Strand, London, W.C.2, quoting ref. ER1202B.

1989

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

GENERAL ASSISTANT ENGINEER is required in the Metering Section of the Technical Department. N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 9, commencing in range £550-£625, and ultimately rising to £705 per annum.

Applicants should possess Ordinary National Certificate in Electrical Engineering and have a good general knowledge of electrical measurements. Previous metering experience is desirable.

Apply quoting Vacancy No. 719MD, on Form AE6, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 28th January, 1958. 2003

A 7 GeV PROTON SYNCHROTRON

is being built at

HARWELL, BERKS.

The following vacancies exist for

ENGINEERS AND TECHNICIANS.

Post 1. To specify general electrical and mechanical plant and services (including contract work). Examination of tenders, project costs and contractors' claims.
(Engineer I or II) (Ref. 1003/48.)

Post 2. To prepare estimates and technical cost reports covering mechanical, electrical, electronic and instrument aspects.
(Engineer I or II) (Ref. 1004/48.)

Post 3. To supervise electrical installation, maintain and operate high-power plant (a 120,000-kVA power supply pulsed to a large electro-magnet).
(Engineer I) (Ref. 1005/48.)

Post 4. To prepare estimates and specifications for mechanical and electrical components, including final cost investigation. A sound background of general knowledge on science, building and engineering will be useful.
(Technical Grade I) (Ref. 1006/48.)

Qualifications: Engineers should be professionally qualified; Technicians should have served an apprenticeship and (preferably) have H.N.C.

Salaries: Engineers, I, £1,790 - £2,080; II, £1,300-£1,740; Technicians, £1,050-£1,270.

Housing, superannuation and excellent conditions.

Send POSTCARD to Recruitment Officer, A.E.R.E., Didcot, Berks (quoting appropriate reference), for application form and details. 1935

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Division

Third Assistant Engineer, Operational Research Section

APPLICATIONS are invited for the appointment of THIRD ASSISTANT ENGINEER in the Operational Research Section of the Generation (Operation) Department with headquarters at Stella North Power Station, near Newcastle upon Tyne.

The work of the section involves the application of operational research techniques to power stations for the purpose of increasing plant availability and improving the efficiency of operation maintenance.

Applicants should be qualified mechanical or electrical engineers, and previous experience of operational research is desirable, but not essential, as there will be opportunities for special training.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule B, Grade 6 (£895-£1,110 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from any Divisional Office of the Generating Board or from Divisional Establishments Officer, Central Electricity Generating Board, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned to arrive not later than 31st January, 1958. 1965

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of SENIOR ASSISTANT in the Administrative Section of the Secretary's Department, Head Office.

The person appointed will, for the time being, be required to undertake duties with the South Wales Electricity Consultative Council. The duties will be of general administrative character and experience of committee work with public bodies is desirable. Knowledge of the electricity industry would be an additional advantage.

Salary Grade 5 (£855/£930) or Grade 6 (£945/£1,020) of the N.J.C. (Administrative and Clerical Grades), according to experience.

Applications stating age, present position and salary, qualifications, experience, and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than seven days after the appearance of this advertisement. 1984

Situations Vacant (continued)

WARWICKSHIRE EDUCATION COMMITTEE

Rugby College of Technology and Arts

APPLICATIONS are invited for the following vacancies in the department of the College dealing with full-time sandwich courses for degree and diploma qualifications.

(a) SENIOR LECTURER in Electrical Engineering to teach Advanced Electrical Engineering and Electronics to the standard of the Part III examination of the Institution of Electrical Engineers.

(b) ASSISTANT LECTURER in Electrical Engineering.

Salary scales :—

(a) Senior Lecturer, £1,350 × £50 to £1,550.
(b) Assistant Grade B, £650 × £25 to £1,025, with additions for experience.

Applicants for (a) should have a degree and professional qualifications with industrial experience.

Both posts are in a rapidly expanding department with an assured recruitment of full-time students where unusual opportunities exist for industrial contacts and research activities.

Forms of application and particulars may be obtained from the Principal, to whom replies should be addressed as soon as possible.

W. COOPER,
Principal.

Rugby College of Technology and Arts,
Eastlands, Rugby.
January, 1958. 1939

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

APPLICATIONS are invited for the following positions:—

ASSISTANT SHIFT CHARGE ENGINEER, MARCHWOOD GENERATING STATION (S/13.983).

Applicants should have had previous experience in a large modern generating station, preferably one with high operating temperatures and pressures, and pulverised fuel or oil fuel equipment.

Salary N.J.B. K.9, £995-£1,055.

ASSISTANT ENGINEER (Grade 10), MARCHWOOD GENERATING STATION (S/13.984).

Those appointed may be required to undertake shift operational duties, to assist on maintenance work, or to perform general station duties. Previous experience of modern generating station plant is desirable.

Salary N.J.B. K.10, £935-£995.

For both vacancies, preference will be given to those possessing qualifications leading to corporate membership of a recognised professional engineering institution, or those holding equivalent qualifications.

Special application forms obtainable only from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned by 29th January, 1958. 2002

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable appointment :—

THIRD ASSISTANT ENGINEER
(Electrical), Distribution/Construction Section, Chief Engineer's Department, Board Headquarters, Glasgow.

Candidates should have a sound general and technical education, preferably leading to Corporate Membership of the Institution of Electrical Engineers. Experience of the construction of 132-kV and 275-kV outdoor substations and maintenance of such equipment is essential.

Present headquarters are at 75, Waterloo Street, Glasgow, C.2, but they will be transferred to the Board's new headquarters in Cathcart, Glasgow, in approximately twelve months.

Salary £895/£1,110 per annum in accordance with Class AX/DX, Grade 6 of Schedule B to the National Joint Board Agreement.

Apply, quoting Reference No. E56/57, on standard form AE6, available from the Secretary, P.O. Box 173, 351, Sauchiehall Street, Glasgow, C.2, not later than Friday, 24th January, 1958. 1954

CITY OF NORWICH

City Engineer's Department

Assistant Electrical Engineer

APPLICATIONS are invited for the above appointment at a salary in accordance with A.P.T. Grade II (£725-£845), Grade III (£845-£1,025) or the Special Grade (£750-£1,030), according to experience and qualifications. Applicants must have the Higher National Certificate or be Graduates of the Institution of Electrical Engineers, have served an apprenticeship in electrical installation work, and have had experience in the design and supervision of street lighting and interior lighting and power installations.

The appointment is terminable by one month's notice on either side and subject to the provisions of the Local Government Superannuation Act, 1953. The successful candidate will, therefore, be required to pass a medical examination. Relationship of applicant to members of the Council or staff must be declared in the application. Canvassing, directly or indirectly, will be a disqualification.

Applicants should state age, qualifications, training, experience, present and previous positions, giving salaries and dates, together with names of three referees.

Applications should be delivered to H. C. Rowley, M.I.C.E., City Engineer, City Hall, Norwich, not later than 10 a.m. on Tuesday, 28th January, 1958. 1999

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division
Vacancy No. 3/ER/58

APPLICATIONS are invited for the superannuable N.J.B. appointment of THIRD ASSISTANT ENGINEER in the SYSTEM PLANNING SECTION, TECHNICAL DEPT. at DIVISIONAL HEADQUARTERS.

Salary AX/DX 6/5, £895-£1,285 according to experience and qualifications.

The section is concerned with the investigation of schemes for the extension of the 132-kV and 275-kV system in South Wales and has to deal with a wide variety of power system problems, including load flow studies, fault investigations and the analysis of system behaviour. The section has at its disposal a D.C. calculating board, and an A.C. network analyser is under construction.

Candidates should have a University Degree or Higher National Certificate (Electrical), and some practical experience in the supply or manufacturing industries would be an advantage.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 31st January, 1958. 1964

EASTERN ELECTRICITY BOARD

Essex Sub-Area
8/58.R.

Southend District, Fourth Assistant Engineers (Two)

CANDIDATES should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, including substations.

Salary N.J.B. Class G, Grade 11 (£740-£785).

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Apply by letter, within 14 days, to J. Linton, M.I.E.E., A.I.Mech.E., District Manager, Eastern Electricity Board, 85, London Road, Southend-on-Sea, Essex. 1998

J. A. CRABTREE & CO. LTD. WALSALL

require DESIGN ENGINEERS for Control Gear and Miniature Circuit Breaker Development. Applicants should have experience in one of the above fields and be capable of initiating all detail development without supervision. It is desirable that candidates hold at least H.N.C. Electrical.

Applications, stating age, experience and salary required, should be addressed to the Technical Director. 2012

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointment :—

THIRD ASSISTANT ENGINEER,
GENERATION (Operation) DEPT., DIVISIONAL HEADQUARTERS.

Salary Class AX/DX, Grade 6, £895 × £25 to £1,020/£1,110 per annum plus London weighting.

The commencing salary will depend upon the qualifications and experience of the successful applicant, who will be required to assist in the Generation (Operation) Department in matters relating to the control of generating stations in the Eastern Division.

Candidates should be familiar with operational requirements of modern generating stations, and preference will be given to those who hold the Higher National Certificate, or equivalent qualifications.

Applications, quoting reference No. 2/8796, stating age and experience, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., by 25th January, 1958.

W. N. C. CLINCH,
Controller. 1966

ADEN

Power Station Superintendent, Electricity Department

TO take charge of the operation and maintenance of a 20,000-kW oil-burning modern steam power station.

Pensionable appointment in the salary range £1,110 to £1,929 p.a. gross or on contract for 18-24 months, in which case a gratuity of £37 10s. for each completed three months' satisfactory service would be payable. Furnished quarters available at low rental. Free passages for officer, wife and family up to four children under eighteen. Allowance for education of children outside Aden. Free medical and dental attention. Generous leave.

Candidates should preferably be Corporate Members of either the I.Mech.E. or the I.E.E., and must be experienced in the operation of a steam station of comparable capacity, with a sound knowledge of generation at 6.6 and 11 kV. First-hand knowledge of boiler water and feed water treatment and considerable experience in the mechanical and electrical maintenance of modern steam power stations and diesel plant is necessary.

Write Director of Recruitment, Colonial Office, London, S.W.1, giving age, qualifications and experience. Quote BCD.145/2/01. 1956

ELECTRICAL WHOLESALERS

Well-known company require

MANAGER

FOR THEIR COVENTRY BRANCH.

Applicants must be energetic and have thorough knowledge of the trade and internal administration. Knowledge of local conditions and industry desirable. Good salary and prospects, superannuation scheme.

Apply in confidence—

Box 1916

BRISTOL EDUCATION COMMITTEE

College of Technology

Principal: G. H. Moore, M.Sc., F.P.S., F.R.I.C.

APPLICATIONS invited for post of SENIOR LECTURER in Department of Electrical Engineering. Candidates should hold degree and have appropriate professional qualifications, with industrial and teaching experience ; must be capable of teaching Electronics and Telecommunications for I.E.E. (Part III), B.Sc. (Eng.) degree, and Dip. Tech. (Eng.).

Salary in accordance Burnham Report (£1,350 × £50 to £1,550).

Application forms, returnable within 2 weeks of date of this advertisement, from Registrar, College of Technology, Ashley Down, Bristol, 7. 1971

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following posts:—

FOURTH ASSISTANT ENGINEERS, System Operation Department, Thames North Grid Control Area.

Salary N.J.B. Class AX/EX, Grade 8, £710 × £25 to £835/£935 per annum.

Applicants should have qualified to Higher National Certificate (Electrical) standard or should be completing studies to reach that standard.

Applicants should be prepared ultimately to undertake shift duties in the area grid control room.

Applications quoting Reference No. 2/8788, stating age, qualifications, experience and present position, should be sent within 10 days of the appearance of this advertisement to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts.

W. N. C. CLINCH,
Controller.
1894

NEW ZEALAND GOVERNMENT

State Hydro-Electric Department

Mercer Steam Power Station

APPLICATIONS are invited for the position of STATION CHEMIST, Mercer, salary £1,000/£1,040 p.a.

The Mercer Station, scheduled for initial operation in July, 1958, will have an ultimate capacity of 180 megawatts, comprising 6 units of 30 megawatts. Boilers will be pulverised coal fired with steam conditions 635 p.s.i., 865° F.

Applicants should have had laboratory experience in a modern power station and be familiar with the associated problems of operation at high pressure and temperature. A recognised qualification for the duties is desired.

Appointee will be required to reside at the nearby departmental power station village. Married accommodation available.

Forms of application, together with further particulars and information, may be obtained from the High Commissioner for New Zealand, 415, Strand, London, W.C.2. Closing date for applications 28th February, 1958. 1932

YORKSHIRE ELECTRICITY BOARD

No. 2 (Huddersfield) Sub-Area

THIRD ASSISTANT ENGINEER (System Design). Applicants should possess at least the Higher National Certificate in Electrical Engineering and preferably be Graduate Members of the Institution of Electrical Engineers. They should have had experience in the design, construction and operation of H.V. and L.V. underground and overhead distribution systems, together with the associated substation plant and equipment.

Salary N.J.B. Class K, Grade 10, £935/£20/£995 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, not later than 31st January, 1958. 2008

DESIGNER OF INDUSTRIAL LIGHTING EQUIPMENT

Applications for the above appointment are invited by

THE BENJAMIN ELECTRIC LIMITED.

Knowledge of fabricating techniques, finishes, lamps and control gear desirable, but initiative and ideas equally important.

The vacancy carries excellent prospects, with appropriate salary according to age, experience and qualifications. Staff luncheon room and pension scheme.

Apply Chief Technical Engineer, Brantwood Works, Tottenham, London, N.17. 177

TECHNICAL ASSISTANTS

required by

THE ATOMIC WEAPONS RESEARCH ESTABLISHMENT, ALDERMASTON, BERKSHIRE.

Technical Assistants being in a training grade will be employed as assistants to professional engineers engaged on the design and engineering development of electronic and light electromechanical equipment required in connection with all aspects of weapons development, nuclear physics and high-speed oscillography. Experience will be gained in the latest constructional techniques such as printed circuits and potting of components.

Applicants should be G.I.E.E. or have suitable equivalent qualifications. They should normally not be over 30 years of age.

Salary £565 (at age 20) to £970 (at age 30 or over).

Contributory superannuation scheme. A house or assistance towards legal expenses on house purchase will be available for married officers living beyond daily travelling distance.

POSTCARDS for application forms to the Senior Recruitment Officer at above address. Please quote ref. 1673/48. 1953

BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION

APPLICATIONS are invited for the position of—

CHIEF TECHNICAL OFFICER.

Applicants should possess a sound technical training, including University Degree in Science or Engineering and/or Corporate Membership of the Institution of Electrical Engineers. Extensive experience on the commercial side of electricity supply very desirable.

Candidates should have a general knowledge of the utilisation of electricity for all purposes in domestic and commercial premises, industry and farms. Advertising or publicity experience will be an advantage.

The salary will be on a scale £2,500–£2,700 per annum plus London allowance, the starting salary depending upon qualifications and experience.

Applications, stating qualifications and experience, age and present salary,, should be addressed not later than 10th February to the Director and Secretary, British Electrical Development Association, 2, Savoy Hill, London, W.C.2. 2009

COUNTY BOROUGH OF WOLVERHAMPTON

Assistant Electrical Engineer

APPLICATIONS are invited for the above appointment on Grade A.P.T. II (£725 rising to £845) in the Borough Engineer's Department. N.J.C. conditions of service. One month's notice. Superannuable post. Medical examination.

Applicants should be experienced in the design and preparation of drawings, specifications and estimates for and supervision of electrical installations for all types of public buildings. Candidates should have served an apprenticeship with a reputable firm and should hold a National Certificate or equivalent qualifications in electrical engineering.

Applications, stating age, qualifications, training and experience, naming two referees, to the Borough Engineer, Town Hall, Wolverhampton, by Monday, the 27th January, 1958. 1900

SYSTEM SHIFT CONTROL ENGINEERS

are required to take charge of the day-to-day running of an extensive high-voltage network interconnecting several large iron and steel works normally operating in parallel with the public supply.

Applicants must have had practical experience in the operation of H.V. switchgear, turbo-alternators and other rotating plant.

Boiler house experience and a basic knowledge of the purpose and operation of protective relays and associated equipment is very desirable.

This is a staff appointment with membership of the company's superannuation scheme.

Applications, marked "Personal," stating age, qualifications, experience and present position, should be forwarded to :—

The Chief Electrical Engineer
DORMAN LONG (STEEL) LTD.
G.P.O. Box 11
Royal Exchange, Middlesbrough 1969

BOROUGH OF WILLESDEN

Borough Engineer and Surveyor's Dept.

Electrical Engineering Assistant

APPLICATIONS are invited for the appointment of ELECTRICAL ENGINEERING ASSISTANT, SPECIAL GRADE (£750-£1,030 p.a.).

London weighting, maximum £30 p.a., is payable in addition to the above salary.

Candidates should possess appropriate qualifications and should have experience in the design of electrical equipment and installation.

The Council cannot assist with housing.

Full details and form of application may be obtained from the Borough Engineer and Surveyor, Town Hall, Dyne Rd., Kilburn, London, N.W.6, and must be returned to the undersigned not later than 9 a.m. on Monday, 3rd February, 1958.

R. S. FORSTER,
Town Clerk. 1967

EAST MIDLANDS ELECTRICITY BOARD

Fourth Assistant Engineer (Shift Operation), Northamptonshire Sub-Area

APPLICATIONS are invited from suitably qualified and experienced engineers for the position of FOURTH ASSISTANT ENGINEER (Shift Operation) on a two-shift rota at the Sub-Area Headquarters, Northampton.

The salary and conditions of the appointment will be in accordance with the National Joint Board Agreement, Class K, Grade 12 (£835 × £15 to £880 per annum plus 10% shift allowance).

Experience of operation duties on a distribution system or in a generating station would be an advantage.

Applications stating age and details of education, qualifications, experience, present position and salary should be forwarded to the Manager, Northamptonshire Sub-Area, 25, Bridge Street, Northampton, to reach him not later than the 1st February, 1958. 1952

M.K. ELECTRIC LTD.

LABORATORY ASSISTANT for electrical and mechanical testing and approval of electric wiring accessories and associated materials. Applicants should possess H.N.C. or equivalent, and must have had previous experience in a test laboratory. Should be qualified to work on own initiative preparing concise and accurate reports.

DESIGNER-DRAUGHTSMAN for design and development of electric wiring accessories. A high salary with good prospects for a senior designer with previous experience in this specialised branch of the electrical industry.

DRAUGHTSMAN for routine data and record work in connection with electric wiring accessories. Must be accurate and neat draughtsman preferably with previous experience of small electrical work.

Applicants should state age, education, experience and salary required, and all letters will be treated in strict confidence addressed to: ref. T.M., M.K. Electric Ltd., Wakefield Street, Edmonton, London, N.18. 1918

SALES REPRESENTATIVES

APPLICATIONS are invited from SALES REPRESENTATIVES of proved ability, who have a sound engineering knowledge of power transformers and have sales contacts with the C.E.A. and Area Boards. Experience in the preparation of tenders would be an advantage.

The company operates a pension scheme and would give assistance regarding accommodation, etc.

Applicants should state qualifications, experience and salary required.

THE LINDLEY THOMPSON TRANSFORMER & SERVICE CO. LTD.,
St. Mary's Road, Langley, Slough, Bucks.
1925

MANUFACTURERS OF MEDIUM-VOLTAGE

Airbreak Switchgear and Motor Starter Equipment require :—

1. DEVELOPMENT ENGINEER.
2. PRODUCTION MANAGER.

Degree or H.N.C. standard desirable; salaries commensurate with qualifications and experience; pension scheme, etc.

Apply in first instance to—Box 1858.

Situations Vacant (continued)

WELSH COLLEGE OF ADVANCED TECHNOLOGY, CARDIFF

Principal: A. Harvey, Ph.D., B.Sc., F.Inst.P.

DEPARTMENT OF ELECTRICAL ENGINEERING

APPLICATIONS are invited for two posts as LECTURER on the salary scale £1,200 × £30 to £1,350 p.a. Candidates should possess a university degree, together with teaching and industrial experience. Preference will be given to candidates qualified to teach in the field of electrical power.

Forms of application, together with further particulars, may be obtained from the Principal, Welsh College of Advanced Technology, Cathays Park, Cardiff.

ROBERT E. PRESSWOOD,
Clerk to the Governors
and Director of Education.

1934

RECTIFIER ENGINEERS

CONTRACT ENGINEERS required in London for studying new projects and preparing preliminary designs involving silicon, germanium, selenium and copper oxide rectifiers for heavy power outputs and light current applications.

Qualifications: Degree in Electrical Engineering or H.N.C. essential. Some experience in industry desirable, but a knowledge of rectifiers is unnecessary. Age up to 35.

Applications to Mr. D. Ashby, Assistant Divisional Manager (Rectifiers), Westinghouse Brake & Signal Co. Ltd., 82, York Way, King's Cross, London, N.1.

1933

DRAUGHTSMAN

required to join a small team engaged on the design and development of instruments for research in the oil industry at

THORNTON RESEARCH CENTRE
(near Chester).

Workshop experience, and some drawing office experience, on instruments or small electro-mechanical units is essential.

Five-day week and attractive pension scheme.

Write to
"SHELL" RESEARCH LTD.
Staff Department (R/D)
16, Finsbury Circus, London, E.C.2

1837

CORPORATION OF THE CITY OF ABERDEEN

Lighting Department

APPLICATIONS are invited for the post of TECHNICAL ASSISTANT in the above department at a salary within Grade C.S.8 (£665 to £715). Particulars as to the appointment may be had from the Superintendent of Lighting, 262, King Street, Aberdeen, with whom applications should be lodged on or before 10th February, 1958.

J. C. RENNIE,
Town Clerk.

Town House,
Aberdeen.
10th January, 1958. 9237

ELECTRICAL ENGINEER

A LARGE electrical contracting organisation requires a first-class man with extensive experience of design, estimating and supervision of all types of contracts. Only those who are doing similar work with large contractors need apply. Excellent prospects for the right man, to whom a salary of up to £1,250 p.a. will be offered.

Please write fullest details to—Box 1938.

RANCO LIMITED

Tannochside, Uddingston, Glasgow, Scotland

SENIOR ENGINEERS FOR RESEARCH AND DEVELOPMENT

ENGINEERS, preferably with Engineering Degree or minimum qualification H.N.C., are required to form the nucleus of a new Research and Development Centre where the accent will be on imaginative thinking and initiative.

The work will be associated with small rotating machines, relays and refrigeration controls, and the laboratories will be located near North Berwick on the East Lothian coast.

Salaries are dependent on qualifications and experience. There is a contributory pension scheme and assistance will be given towards housing and removal expenses.

Enquiries should be addressed in the first instance to Chief Engineer, giving brief details of experience, qualifications, age, etc.

222

NORTH WESTERN ELECTRICITY BOARD

Appointment of Personnel Officer

APPLICATIONS are invited for the position of PERSONNEL OFFICER in the Secretary's Department. The duties will involve the control of the Establishment, Welfare and Education and Training Sections of the Board.

The appointment, which is superannuable, will be subject to the conditions of the National Joint Managerial and Higher Executive Grades Committee for the Electricity Supply Industry and will carry a salary of £2,300 × £75 to £2,450 - £2,500.

Applications with full details of qualifications, degrees and experience should be addressed to the undersigned and marked "Appointment of Personnel Officer," and should arrive not later than 30th January, 1958.

JAMES W. CHANT,
Secretary.

Cheetwood Road,
Manchester, 8. 1961

POWER RECTIFIERS

A LARGE manufacturing firm in the Midlands requires an engineer to assist in development and design of high-power rectifier equipments. The department handles rectifiers of all modern types and for all kinds of applications, offering scope for exceptionally wide experience and interest, with good salary and prospects.

Previous rectifier experience not necessary, but an electrical or mechanical degree or approximate equivalent, and some practical experience, are desirable. Very good residential district, with excellent educational facilities of all kinds.

Apply with full details to—Box 1978.

ELECTRICAL AND MECHANICAL ENGINEERS AND DESIGNERS

LEADING firm of electric lift manufacturers, with head office in the Midlands, have progressive posts open to ELECTRICAL AND MECHANICAL ENGINEERS AND DESIGNERS, experienced in modern lift techniques and the design and development of control equipment.

All amenities, including pension scheme.

Apply in confidence, "For attention of Managing Director," to—

Box 1880

CLASSIFIED ADVERTISEMENTS

ARE PREPAID

MID-WORCESTERSHIRE HOSPITAL MANAGEMENT COMMITTEE

Group Engineer's Department

APPLICATIONS are invited for the appointment of TECHNICAL ASSISTANT, to assist on site surveys, preparation of plans, specifications and estimates for engineering and buildings maintenance generally. The post offers excellent opportunities to a young man anxious to increase his experience.

Salary at age 23 years £445 per annum rising to a maximum of £615 per annum.

Applications to be addressed to the undersigned stating qualifications, age and experience and names of three referees.

C. M. SMITH,
Group Secretary.

Birmingham Road,
Bromsgrove. 1988

THE NATIONAL INSPECTION COUNCIL FOR ELECTRICAL INSTALLATION CONTRACTING

requires an INSPECTING ENGINEER for the area of South Wales, Monmouthshire, Herefordshire and West Gloucestershire.

Starting salary £1,000 p.a., together with car allowance, travelling and subsistence allowances and superannuation.

Applicants must have had supervisory experience in electrical installation contracting, a thorough knowledge of the I.E.E. Wiring Regulations and of good wiring practice, and be prepared to reside within the area.

Applications by 31st January to the Secretary, National Inspection Council for Electrical Installation Contracting, 13, Victoria Street, London, S.W.1. 1843

ACCOUNTANT with experience of job costing required by electrical contracting company in Nigeria to take charge of the company accounts. Remuneration will be between £1,150 and £1,350 per annum and is reviewed annually. Pension scheme, free furnished quarters in Africa and free passages. Tours normally 20 months followed by 4 months' leave. Please write giving full details to—Box 1940.

AGENT required by Midland electrical control gear manufacturers mainly specialising in motor controls, to cover Yorkshire and the North-East. Must be an engineer capable of discussing technical matters and have connections with machine tool and similar manufacturers.—Box 1861.

ARMATURE winder for all types A.C. and D.C. repair work. Good rate, bonus, five-day week, overtime, etc.—Lewis Electric Motors Ltd., Moor Works, Blackamoor Lane, Maidenhead, Berks. 142

ASSISTANT electrical engineer required by steel tube manufacturers in Birmingham, to be responsible for all electrical maintenance and repairs, including a large number of overhead cranes and other lifting appliances, total load 7,000 kVA. Applicants must be between the ages of 24 and 30, have a university degree or equivalent, and have served a recognised apprenticeship or training for at least 3 years in electrical engineering. Contributory pension scheme. Apply stating age, qualifications, experience and salary required to—Personnel Manager, Tubes Limited, Rocky Lane, Aston, Birmingham, 6. 1839

ASSISTANT electrical planning engineer for factory layout organisation of group of manufacturing companies. Works trained. Preferably to H.N.C. level, experienced in L.T. and H.T. distribution and/or generation, lighting, power and automatic control design, estimating or supervision. Salary £800-£900.—Box 1862.

ASSISTANT mechanical contract design engineers required by firm of consultants in their London office. Applicants must have had a good mechanical training and experience, preferably with steam power plants and associated equipment. Duties will consist of the preparation of specifications, estimates and contract documents, and also to assist in the execution of large engineering contracts from the design stage through to the completion of work at site. Electrical experience and knowledge of nuclear power station practice will be an advantage. The salary offered will be according to experience and ability, and the post is pensionable. Applicants must state fully their technical qualifications and give full particulars of training and experience which must be addressed to the Personnel Officer, Ewbank & Partners Ltd., 10/11, Grosvenor Place, London, S.W.1. 2016

ARON ELECTRICITY METER Ltd. invite applications for the position of indoor sales engineer. Applicants are required to have a sound technical background, preferably applied to electricity meters and electronic equipment. Superannuation scheme in operation. Applicants should supply full details of experience, age and salary required, and replies, which will be treated in the strictest confidence, should be addressed to the General Sales Manager, Aron Electricity Meter Limited, 72-82, Salusbury Road, London, N.W.6. 1888

ASSISTANT representative required by leading manufacturers for Kent and Sussex with knowledge of accessories and switchgear. Full particulars in confidence stating experience, age and salary required and whether car owner. —Box 1941.

BOOTS PURE DRUG Co. Ltd. require engineering draughtsmen for the preparation of electrical installation schemes and specifications, as required for retail shops. 5-day week, good canteen facilities, contributory superannuation scheme, 2 weeks' holiday with pay, increasing to 3 weeks. Applications, in writing, giving experience and qualifications to Personnel Manager, Station Street, Nottingham. 1863

CIRCUIT design draughtsmen required by company manufacturing industrial control equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 273

CONSULTING engineers require junior electrical draughtsman/engineer for lighting and power installation in offices, schools, hospitals, etc. Write stating age, experience, qualifications, etc., to Donald Rudd and Partners, 171, Alcester Road, Moseley, Birmingham, 13. 9239

DESIGN draughtsman for jig, tool and component design. Senior staff position offering excellent prospects for the applicant with the desired qualifications. Apply stating age, experience, qualifications and present salary to Backer Electric Company Ltd., Rotherham. 1882

DESIGNER-draughtsman required, experienced in L.T. switchgear layout and fabrication of sheet steel control panels. Knowledge of power and control circuits required. The position entails considerable responsibility and ability to work with minimum supervision, in a small organisation manufacturing switchgear and allied apparatus. Permanent position, pension scheme. Apply — Chief Engineer, Astral Switchgear Ltd., Alma Road, Enfield, Middx. 1844

DEWHURST & PARTNER Ltd. require technical estimator for preparing tenders in their estimating engineering department. Applicant must have good electrical engineering background and have basic knowledge of motor control equipment and its applications. The position is a senior one, and housing assistance will be given to successful applicant if necessary. Canteen facilities, pension scheme. Write giving age, experience, etc., to — Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middlesex. 274

DRAUGHTSMAN designer, also a junior, sought by electrical contractors (London, W.C.2) for first-class installations. The benefits are work on all types of buildings, stability and scope for individuality with old-established firm, attractive prospects, good salary and permanency for right men. Write in confidence stating age, experience and salary expected.—Box 2017.

DRAUGHTSMAN required in expanding design and development section of switchgear manufacturers. Previous switchgear experience and a good technical background necessary. A.E.S.D. rates of pay and bonus scheme, non-contributory superannuation scheme also in operation. Assistance with housing available if necessary to successful applicant. The company is situated in pleasant country surroundings within six miles of the Devon coast. Write, stating experience, age, etc., to—Ottermill Switchgear Ltd., Ottery St. Mary, Devon. 1920

DRAUGHTSMEN for South Manchester office; interesting work on layouts and diagrams, 33 and 11 kV, switchgear, transformers, cables, etc. Apply—South Wales Switchgear, 3, Hawthorn Lane, Wilmslow, Cheshire. 1921

EAST African installation contractors require supervising engineer, preferably experience abroad, aged 30/35, for general work.—Box 1991

DRAUGHTSMEN (seniors) required for detail design on switch and control gear. State age, experience and salary expected to the Secretary, J. A. Crabtree & Co. Ltd., Lincoln Works, Walsall. At least A.E.S.D. rates will be paid to suitable applicants. 1990

ELECTRICAL draughtsmen accustomed to plant work required by a modern shipbuilding and engineering company in North-West of England. Preference given to applicants holding Higher National Certificate in Electrical Engineering, and with experience in lighting and power layouts, including distribution for large workshops and offices, substations, welding equipment, machine tool installations, etc. A.C. and D.C. systems. Applicants should state age, technical qualifications and experience. Salary commensurate with experience. Five-day week. Contributory pension scheme. The works are situated in a pleasant area, with good sea beaches and safe bathing. Sports club near to the works with comprehensive recreational facilities. All applications will be treated in confidence and should be addressed to the Labour Manager (S). —Box 1937.

ELECTRICAL engineering supervisor (senior). London area. Fully experienced all types of contracting works from design to completion. Write stating age, experience and salary required, to Box ER.874, c/o 191, Gresham House, London, E.C.2. 2014

ELECTRICAL engineers specialising in industrial drives and controls require assistant engineer for installations and service section. Office location outer London N.W. area. Application in writing should include full details of education, training and present position. Excellent prospects for men with suitable experience with electrical contractors or similar work. Reply to—Box 2018.

ELECTRICAL fitter required by the Central Electricity Generating Board at Northampton Transmission Section. The work includes the overhaul of existing 132,000 volt transmission equipment and in the future 275,000 volt transformers and switchgear. Previous experience of H.V. equipment essential. Rate of pay 4s. 7½d. per hour, 44-hour week. Terms and conditions of service in accordance with the N.J.I.C. agreement. Applications in writing stating age and experience, to Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham. Please quote vacancy number 10/58/ER. 2019

ELECTRICAL or mechanical engineer wanted by large German company for German-English translations. Applications are invited from British-trained engineers with a knowledge of Germany, who have an inclination towards translation work and desire to work in a good environment in Germany for at least 2/3 years. Write stating age, education, experience, salary required, to—Box 1942.

ELECTRICAL manufacturing company in London (City) requires a commercial assistant in their lamp and lighting fittings division. This is a senior position with good prospects for the right man. Applicants should be aged about 30 years and have some electrical background. A knowledge of lamps and fittings would be desirable but is not essential. Only those who can prove their ability to progress by hard work on their own initiative need apply. Competitive salary, pension and bonus schemes. Apply giving full particulars, quoting ref. J.3, to—Box 1973.

ELECTRICIAN/electrical mechanic, first-class experience installation work, required by large electrical concern. 12 months' service overseas. Excellent opportunity. Write, experience, age, references.—Box 2020.

ELECTRICIAN wanted for occasional small contract jobs.—HOLborn 8622. 1845

ELECTRO-mechanical draughtsmen required for production drawing office of company engaged in the manufacture of control gear equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works. Inverness Road, Hounslow, Middx. 275

ENGINEER (Grad. I.E.E. std.) to assist in development and testing of power capacitors and of transformers up to 15 MVA. Post provides an ideal opportunity to gain experience in a diversity of electrical fields including use of a 1,500-kV Surge generator. Apply in writing in the first place to—Chief Engineer, Bryce Electric Construction Co. Ltd., Kelvin Works, Hackbridge, Wallington, Surrey. 2021

ENGINEER required for high voltage engineering work, age 22-27, with degree or H.N.C. and works training (electrical power equipment). Apply, giving details of training and experience, to the Assistant Secretary, The Micanite & Insulators Co. Ltd., Empire Works, Blackhorse Lane, Walthamstow, London, E.17. 2022

ESTIMATING. E. K. Cole Limited, Malmesbury, Wilts., have a vacancy for an estimator. The company is engaged on electronic equipment and applicants should have had a wide experience in estimating this class of work and small quantity production. Good practical shop training is considered essential and an engineering apprenticeship desirable. Good salary will be offered and there is a possibility of housing accommodation being available to suitable applicants. Full welfare facilities and contributory pension scheme. Please apply in writing with details of education, training and experience, to the Personnel Manager. 228

ESTIMATOR required by Service Electric Co. Ltd. Must be capable of preparing complete schemes for industrial installations and experienced in public authority work. Reply to —Honeypot Lane, Stanmore, Middx. 1922

ESTIMATOR/supervising engineer required for established electrical contractor's London office. Applicants should have full experience in the preparation of tenders and setting out of work from design stage to completion. Write stating age, experience, etc., and salary required to—Box 1974.

EVERSHED & VIGNOLES require two engineers of H.N.C. standard for their instrument division sales department. Write, giving full details of training and experience, to —Instruments Manager, Acton Lane Works, London, W.4. 2023

EXHIBITION organiser's assistant. A male assistant organiser, age 25 to 28, with experience of the electrical industry, is required in the Exhibition Office of the British Electrical Development Association. Duties involve records, progressing, reports and liaison with electrical manufacturers and stand-fitting contractors, in relation to planning the Association's electrical exhibits at national shows and exhibitions. A knowledge of electrical appliances selling and display desirable. Salary £680 × £20 to £740 p.a. plus London allowance; pension scheme; staff canteen; good prospects for advancement. Write stating age, qualifications and experience to — Director, E.D.A., 2, Savoy Hill, London, W.C.2. 1865

EXPERIENCED electrician required to take charge of running and maintenance of back pressure turbine power station and ancillary motors, etc., in paper mill. House available. Apply—Witchampton Paper Mills Ltd., Witchampton, Wimborne, Dorset. 1768

EXPERIENCED man required for control and development of sales in Greater London area of internationally famous electric dry shaver. Opportunity for promotion to senior position. Please write giving full particulars and remuneration required, marking envelope Confidential, to—Manager, F. & G. Turnpenny Ltd., 5, Great Winchester Street, London, E.C.2. 2024

EXPERIENCED representative required for Essex, preferably with connection in the area. Substantial existing turnover handed over. Salary, commission, expenses, pension scheme. Car provided. Applications giving full details to be sent to General Manager, Sloan Electrical Co. Ltd., 240-250, Ferndale Road, Brixton, London, S.W.9. 1972

FOREMAN required to take charge of a small pilot scheme for the manufacture of specialised electrical and radio components. Previous experience on this type of work plus a basic knowledge of electrical theory are essential qualifications. Preference will be given to an applicant with winding shop experience. The post, which is available in S.E. London, is pensionable and offers excellent prospects for a man with the above qualifications who has initiative and leadership and would enjoy helping to build up a new organisation. Apply in writing with full particulars to — Personnel Manager (P.A.2), Remploy Ltd., 25/28, Buckingham Gate, London, S.W.1. 1975

FOREMAN electrician required to supervise and maintain electrical installations and plant. Age 30/40. Pension scheme. Excellent prospects. Southall area. Apply — M. D., Taylor Woodrow Plant Company Ltd., Taywood Road, Ruislip Road, Greenford, Middx. 1877

***Situations Vacant** (continued)*

FIRST-class representative required by Birmingham wholesaler, with knowledge of electrical contracting and domestic appliance trade. Must have live connection with contractors, electric and radio shops and industrial users. Remuneration at least £1,000. Only top-grade men with several years' experience in similar trade need apply, in confidence, stating age, experience, etc., to—Box 1976.

FOSTER TRANSFORMERS Ltd., South Wimbledon, London, S.W.19, have vacancies for testers for work on all types of transformers up to 3,000 kVA. Applicants should have had some training or experience in the electrical industry. Apply in first instance giving details of experience and salary required to the Personnel Officer. 1840

H. J. HEINZ Co. Ltd. have a vacancy for a draughtsman for electrical services. Applicants should be aged 25/40, with a minimum of 5 years' drawing office experience, and be familiar with all aspects of main and subsidiary electrical services, and should preferably be of H.N.C. standard. Please apply to the Personnel Officer, H. J. Heinz Co. Ltd., Waxlow Rd., Harlesden, London, N.W.10. 1883

JUNIOR draughtsman required. Some electrical knowledge desirable but not essential. Apply—L. Weekes (Luton) Ltd., Wingate Road, Luton, Beds. 1923

LEADING electrical draughtsman required with experience of schemes for H.V. and M.V. distribution for heavy industry, illumination and equipment for industrial building. Applicants should be qualified to H.N.C. standard. Salaries are assessed in accordance with age, qualifications and experience and will be reviewed annually. Contributory superannuation and widow's pension funds are in operation and there are excellent canteen, welfare and recreational facilities. Applicants should apply in writing to the Chief Engineer, Pilkington Brothers Limited, Cowley Hill Works, St. Helens, enclosing a brief history of their career and details of their education and qualifications. 2025

LONDON consulting engineers require electrical engineers for installation design for hospitals, commercial buildings, schools, etc. Write stating age, qualifications, experience and salary required to—Box 160.

MOTOR control gear sales engineer required for South Wales. Applicant should be aged 25-35, with a good technical and practical knowledge of contactor motor control gear and with some successful selling experience or a real aptitude for sales work.—Box 1884.

OPPORTUNITY for considerable future advancement. Electrical wholesale company require male or female assistant at head office, London, W.1. Good at figures. Previous electrical trade experience desirable but not essential. Five-day week. L.V.s. Salary by arrangement. Reply in strict confidence to—Box 1885.

PICKERINGS Limited have vacancy with excellent prospects for sales manager at their London office. Apply in confidence to—Managing Director, Pickerings Lifts, Globe Elevator Works, Stockton-on-Tees. 2026

PROVINCIAL engineering firm requires senior estimator/supervisor for electrical contracting department. Office trained with practical experience. Write age, experience, references.—Box 9228.

REPRESENTATIVE required for electrical wholesaler, South East London area.—Box 2027.

SALES engineer for Gloucestershire and Wiltshire required by E.W.F. wholesalers. Applicants should have practical experience in contracting or as works engineer. Car provided. Reply stating age, experience and salary required to—Box 9225.

SALES engineer required for London and Home Counties. Good position for man with experience and energy, selling transformers and rotating machinery. Pension scheme. Apply stating full particulars—Ref. PM, Veritys Ltd., Brettenham House, Strand, London W.C.2. 1847

SALES manager required by A. C. Morrison (Engineers) Limited, Town Quay, Southampton. Knowledge of engine-driven electrical generating plant up to 250 kW, including automatic mains failure and "no-break" equipment. The position, which is pensionable, requires knowledge of overseas markets and first-class electrical sales background. Apply with full details to Managing Director. 1977

SALES representatives required for North, Midlands and South of England areas for company manufacturing full range of electricity meter products. Applicants should have good administrative ability and personal contacts at all levels in this field of sales. Applicants should supply full details of experience, age and salary required. Sales commission, car allowance and superannuation scheme. Replies, which will be treated in the strictest confidence should be addressed to the General Sales Manager, Aron Electricity Meter Limited, 72-82 Salusbury Road, London, N.W.6. 1886

SENIOR and junior engineers. The research and development section of a long-established manufacturer situated in N.W. London has vacancies for senior and junior engineers. A specialised knowledge and experience of instruments, energy metering, electronics or electro-mechanical devices would be advantageous. Educational qualifications required are science or engineering degree or H.N.C. with endorsements for the senior positions, or at least O.N.C. level for juniors. The salaries offered are £800 upward for seniors and £500-£750 for juniors according to experience. A staff pension scheme is in operation and working conditions are excellent. Write, giving full particulars and present salary, to—Box A.K., c/o J. W. Vickers & Co. Ltd., 7/8, Great Winchester Street, London, E.C.2. 1943

SERVICE engineers required for company manufacturing full range of electricity meter products. Experience of electricity meters desirable but not essential. Applicants must have sound technical background and be prepared to travel throughout the British Isles. This position offers first-class opportunities for further advancement. Applicants should supply full details of experience, age and salary required. Car supplied and superannuation scheme. Replies, which will be treated in the strictest confidence, to be addressed to the General Sales Manager. Aron Electricity Meter Ltd., 72-82, Salusbury Road, London, N.W.6 1887

SETTER mechanic, experienced packaging machinery, required for North London factory. Excellent conditions, non-contributory pension scheme. Apply — Personnel Officer, International Chemical Co. Ltd., Braydon Rd., London, N.16. 1944

SHIFT inspector-testers. Vacancies occur in laboratory and plant controlling chemical and plating processes. The work is on a shift basis and suitable applicants will be trained for light interesting work. Previous inspection experience desirable but not essential. Excellent canteen and recreational facilities and a good rate of pay can be obtained after training. Applications in writing should be made to the Labour and Welfare Officer (Oldbury), Messrs. Albright & Wilson (Mfg.) Limited, P.O. Box No. 3, Oldbury. 1903

SOUTH Wales electrical contracting company require the services of a progressive branch manager. This is a post of considerable responsibility and remuneration will be agreed accordingly. Applicants must at present be engaged in the management of an electrical contracting office or be completely familiar with such duties; and preferably to normally be resident in South Wales. Your applications will be dealt with in the strictest confidence. Please reply in the first instance to Box 1794, giving full chronological details of your experience.

SOUTH WALES SWITCHGEAR Limited require a representative for Scotland, generally to be based at the new factory in Glasgow, but to deal with all outside sales for the Scottish territory. Applicants should have good contacts in the electricity supply industry and some knowledge of industrial requirements for switchgear and transformers. Applicants suitably qualified are invited to reply to the General Manager, South Wales Switchgear Ltd., Blackwood, Monmouthshire, giving details of age, experience and salary required. 1870

STOREKEEPER and trade counter asst., fully experienced, required by expanding and progressive electrical wholesaler. Write full details age, experience, etc., to—Finch Wholesale Electrics Ltd., 550, Ley Street, Ilford, Essex. 2028

SURVEYORS, preferably young, with good knowledge in use of theodolite and level, for various Scottish areas. Some electric transmission line survey experience an advantage but not essential. Give age, full details of experience and salary required to—Box 558, Keith & Co., 137, Prince St., Edinburgh. 1957

STOREKEEPER required with good knowledge electrical wholesale trade. Good wage. Apply—Bennett & Fountain, 122, Great Titchfield Street, London, W.1. 2036

TECHNICAL sales correspondent required by Sangamo Weston Ltd. Applicants should preferably have had previous engineering and commercial experience in connection with electrical measuring instruments, but those similarly employed in some other branch of the lighting electrical engineering industry will be considered. Age preferably 25-35 years. Apply in writing to — Employment Manager, Great Cambridge Road, Enfield, Middlesex. 1945

TELEPHONE mechanic/engineer, first class, required large firm engineers, 12 months' service overseas. Excellent opportunity. Write age, experience.—Box 1872.

TELEPHONE plumber-jointers required by firm of cable manufacturers for service in this country and abroad.—Box 1979.

TESTER of automatic electric control equipment required. Interesting work with good prospects. O.N.C. standard preferred. Five-day week, pension scheme, canteen facilities. Please write giving full details of age, previous experience, qualifications, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 277

TRANSFORMER designer/draughtsman, experienced with units up to 250 kVA. Salary commensurate with experience. Bonus and free housing accommodation to suitable applicant.—Stewart Transformers Ltd., 75, Kilburn Lane, London, W.10. 2029

TRANSFORMER engineer required to control design and drawing office handling transformers of all types up to 250 kVA. Applicant must be fully experienced in the design of transformers in this range and a knowledge of costing would be an advantage. Salary £900 per annum. Apply — Willesden Transformer Company Limited, Manor Park Works, Manor Park Road, Harlesden, London, N.W.10. 311

WELL-established firm of electrical contractors require contracts manager to take complete control of all contract work in their S. Beds. and N. and Mid Herts. area. Full particulars of age, experience, salary required, etc., to—Box 2030.

WHOLESALER requires experienced assistant for mains cable and switchgear section.—Batt Elecl. Co., 6, Dock St., London, E.1 (Tel. Royal 5905). 2034

YOUNG engineer, works experience preferable, required to train as commercial estimator electric motors and generators. North Kent district. Commencing salary £10/£12. Reply full details—Box 344.

YOUNG graduate or near graduate in electrical engineering, age about 25, required as assistant to London purchasing officer of Lisbon Electric Tramways. Commencing salary according to experience, minimum of £600. Luncheon vouchers. Contributory pension scheme. Write in confidence giving full details to—Secretary, Lisbon Electric Tramways Ltd., 4, London Wall Buildings, London, E.C.2. 1958

YOUNG man, preferably trained in resistance welding, required to assist managing director in developing sales of portable spot welders, with a view to taking over as sales manager. Permanent post, good prospects with young, vigorous and rapidly expanding manufacturer. —Box 1947.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

A.M.I.E.E. (1951), Englishman, U.K. trained, aged 34, with fourteen years' experience in India, in sales, service and factory management, seeks post in Commonwealth.—Box 9235.

AUTOMATIC telephone & telecommunications engineer, ex-R.N.V.R. W/Tel., seeks wider outlook.—Box 9238.

EXPORT-sales manager, thoroughly experienced in radio, T.V., domestic appliances and heavy gear exports, aged 43, desires change. Fully qualified professional electrical and mechanical engineer. Languages: French, German, Spanish, Dutch. Willing to travel. Car owner. —Box 9240.

ELECTRICAL contractors' London manager seeks change of situation. Experienced preparation of tenders, schemes and final accounts for all classes of electrical work. Particularly keen to secure managerial or executive post with established company desiring improved organisation. Able to introduce new business if required. Advertiser's private secretary wishes to accompany him when moving. Please apply—Box 9227.

ELECTRICAL engineer, D.F.H., 25 years' experience, technical liaison, sales representation, lifts, hoists, cranes, motors, comm. motors, seeks change. London area preferred. —Box 9234.

ENGINEER, A.M.A.I.E.E. (38), experienced switchgear, control gear and electronics, sales and managerial, requires position London and Home Counties and/or S.W. England.—Box 9236.

SALES engineer, age 41, A.M.I.E.E. Home and overseas experience. Open to offers, London preferred.—Box 9224.

SALES representative requires position. Excellent connection with industry from Birmingham to Dounreay, including ship building on Tyne and Clyde. All correspondence answered.—Box 9231.

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E. R.

By Order of the Secretary of State for Air

For No. 14 M.U., R.A.F., CARLISLE
(Goods stored at Sandysike & Blackwood, 9 miles north of Carlisle).

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Wednesday and Thursday, 5th & 6th February, 1958, at 10.30 a.m.

SALE IN COUNTY HALL, CARLISLE.

900 LOTS OF ELECTRICAL AND INDUSTRIAL MACHINERY AND SUNDRIES

including 400 Generators, including 57 Cub Diesel Four-stroke, 230-v., 5.6-kVA Dynamos; Battery Charging Sets, Transformers, Acid and Alkaline Batteries, Starters, Motor and Vehicle Spares, Receivers, Transmitters, Transmitter/Receivers, Pumping Equipment, Coles Crane and other spares, Fire Extinguishers, Test Sets, Instruments, Clocks, Watches, 68 Projectors, 16-mm. type E with speaker transformer and tripod, Cameras, Lamps, Containers, Furniture, 250 Metal Single Bedsteads, and other useful lots.

VIEWING: Monday to Thursday, 3rd to 6th February, but see catalogue for times and places of viewing.

CATALOGUE, 6d. each, admits two to viewing but one only to sale, available from the Auctioneers,

HARRISON & HETHERINGTON LTD.
Carlisle
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2031

ARTICLES FOR SALE

TRANSFORMER WELDERS

20/300 amps., 250 amps. and 160 amps.

OIL-cooled pattern Arc Welders for operation on 400/440 volts, single-phase, 50 cycles; alternatively 230 volts, single-phase, 50 cycles; dual welding voltage 50/80; output current variable between 20/300 amps., fitted with coarse and fine regulators in robust steel tank. £85.

Similar 250-amp. units. £71.

Similar 160-amp. units, but not fitted with wheels. £45.

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ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., 1-p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

GENERATORS

100 Unused 30-kW, 225-volt D.C. Generators by MAWDSLEY, compound wound, 960 and 1,440 r.p.m., Class 2, continuously rated, cowl ventilated.

First-class condition.

Immediate delivery covered by guarantee.

Lightweight Alternators for Portable Generating Sets

100 Unused 4-kVA, 230-volt, single-phase, 100-cycle Alternators, 3,000 r.p.m., self-exciting with automatic voltage regulators.

Immediate delivery with guarantee.

Alternators only ..... Price £30
Alternators with A.V.R.s Price £45

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VARIABLE SPEED COMMUTATOR MOTORS

h.p.	Make	Speed	Enclosure
45/15	L.S.E.	1500/500	D/Proof
40/8	B.T.H.	1150/230	S/Prot.
30/6.6	L.S.E.	2250/500	S/Prot.
18.5/5.5	B.T.H.	800/250	S/Prot.
18/4.5	HOLMES	1450/360	D/Proof
6/1.5	B.T.H.	1120/280	S/Prot.
4/1	B.T.H.	1650/413	S/Prot.

All 400/440 volts, 3-phase, 50 cycles.
Machines in first-class condition.

WHITEFIELD MACHINERY & PLANT LIMITED,
Cobden Street, Salford, 6
(Tel. PEN. 4746). 1928

550-kW TURBO ALTERNATOR

by ENGLISH ELECTRIC. New in 1949. Initial steam pressure 170 lb. per s.i.g. Initial steam temperature 500° F. Exhaust pressure 15 lb. p.s.i.g. Output 687.5 kVA at .8 power factor, 400 volts, 3-phase, 50 cycles. Complete with alternator panel and breaker. Cabling between alternator and switchboard. Complete with full set arrangement drawings and operating instructions.

Apply for further information.

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2032

FOR IMMEDIATE SALE

3 Electric Box Type Vitreous Enamelling/Annealing 250-kW Furnaces. Internal dimensions 54" wide × 32" high × 13 ft. deep. Complete with loading forks, power-operated door and temperature control gear 0-1,000° C. by CAMBRIDGE. In first-class order throughout and available for inspection.

THE GENERAL ELECTRIC CO. LTD.
Swinton Works, Mexborough, Yorks
1959

ABABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- Slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-100 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

BARGAINS in electric motors are always being obtained from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Stocks include A.C. and D.C. motors, second-hand and new up to 30 h.p. Starters, slide rails and pulleys. Ring Mon. 3355 for your requirements. 50

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (EALing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards. — Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS, 110 and 220 v. D.C./230 v. A.C., .5 to 6kVA; also A.C./D.C. Special voltages at short notice.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ELECTRICIANS. Send for details Shaftesbury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues. — The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FRACTIONAL h.p. motors, new, ex stock, A.C./D.C., Universal, B.T.H., Delco-Remy, G.E.C., Fracmo, Newman, Scophony. — Jeary Electrical Co. Ltd., 5, Lamb's Buildings, London, E.C.1. 126

GENERATING plant. Petter twin-cylinder engine (S type), 36/42 b.h.p. direct coupled D.C. generator, 110 volts, 240 amps. Also 1 Crypton rectifier, input 400 volts, 3-phase, 50 cycles, output 100/110 volts, 45 × 2 amps. Offers to—Regent Theatre, Poole, Dorset. 9233

GENERATING plants, remote and M/F up to 10 kVA; also secondhand A.C. and D.C. sets up to 100 kVA, large stock all types. Special plants built at short notice.—Powerco Ltd., 312, York Road, London, S.W.18 (Tel. VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW. A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 163

HOUSE service meters, C. & H., Aron, E.A.C., 20-240 v. A.C., 1.-ph., 50 c., 2½ amps., 7s. 6d. each, 1s. 6d. postage; 5 amps., 17s. 6d. — Universal Electrical, 217-221, City Road, London, E.C.1. 37

Articles for Sale (continued)

LONDON: 1,000-amp., 110/115-v. D.C. diesel generator set with switchboard, full tropical rated for mobile use; also 600-amp. set similar.—Box 1807.

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTORS, starters, circuit-breakers. Huge stocks of all types, ½ to 300 h.p. Stock list or quote by return.—J. S. Ramsbottom & Co. Ltd., Bow St., Keighley (3774-5-6). 70

NAMEPLATES, engraving, diesinking, stencils. — Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading. — Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. or D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters. —Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switchholder incorporated is proving itself the most popular unit. Suitable for most fittings. 57s. 6d. each subject. — F. W. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY Credit Meters, single & poly-phase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

ROTARY converters in stock, all sizes: enquiries invited. — Universal Electrical, 221, City Road, London, E.C.1. 34

SMALL BR screws and nuts in steel, brass and stainless steel, from stock.—Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

SWITCHFUSES, 800 unused Sandamax double-pole, 500-volt, 60-amp., ironclad, weatherproof switchfuses, with indicator lamps. —H. H. Bradford Ltd., Ramsey, Harwich, Essex (Telephone, Ramsey 327). 9229

TELEVISION slotmeters & Time Switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

TIME switches from stock. Reconditioned or new. 12 months' guarantee. Lists from—J. W. Hughes, 3, St. Thomas Street, London Bridge, London, S.E.1 (Tel. HOP 2759). 178

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generator sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

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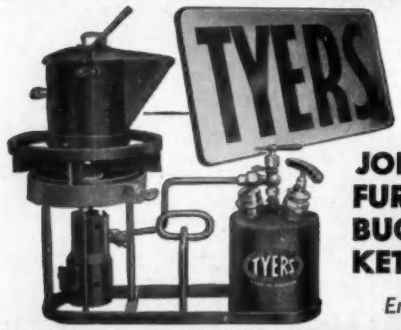

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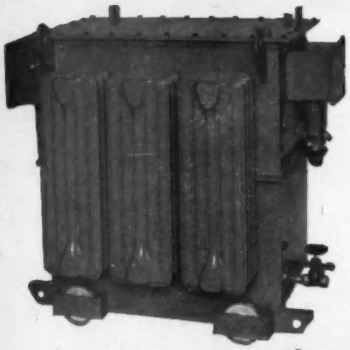

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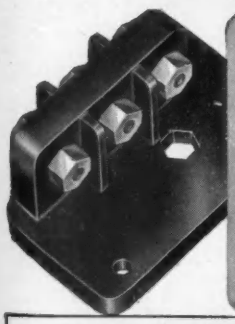

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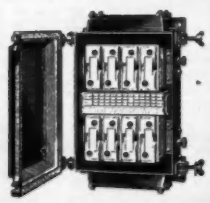

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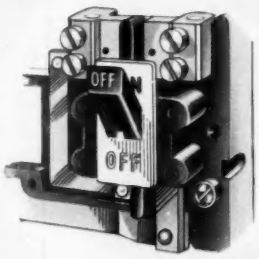

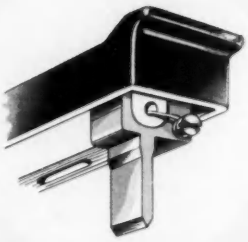

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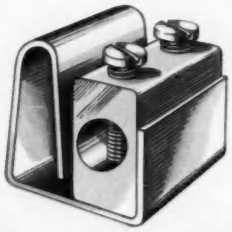

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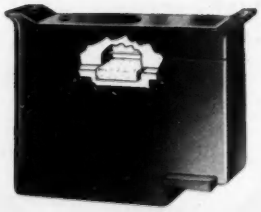

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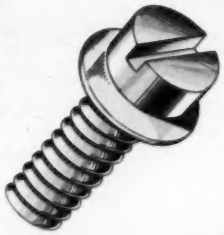

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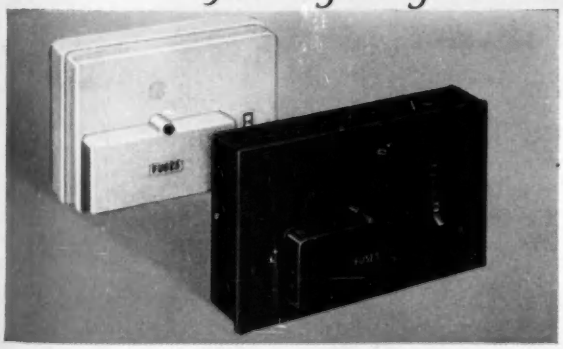

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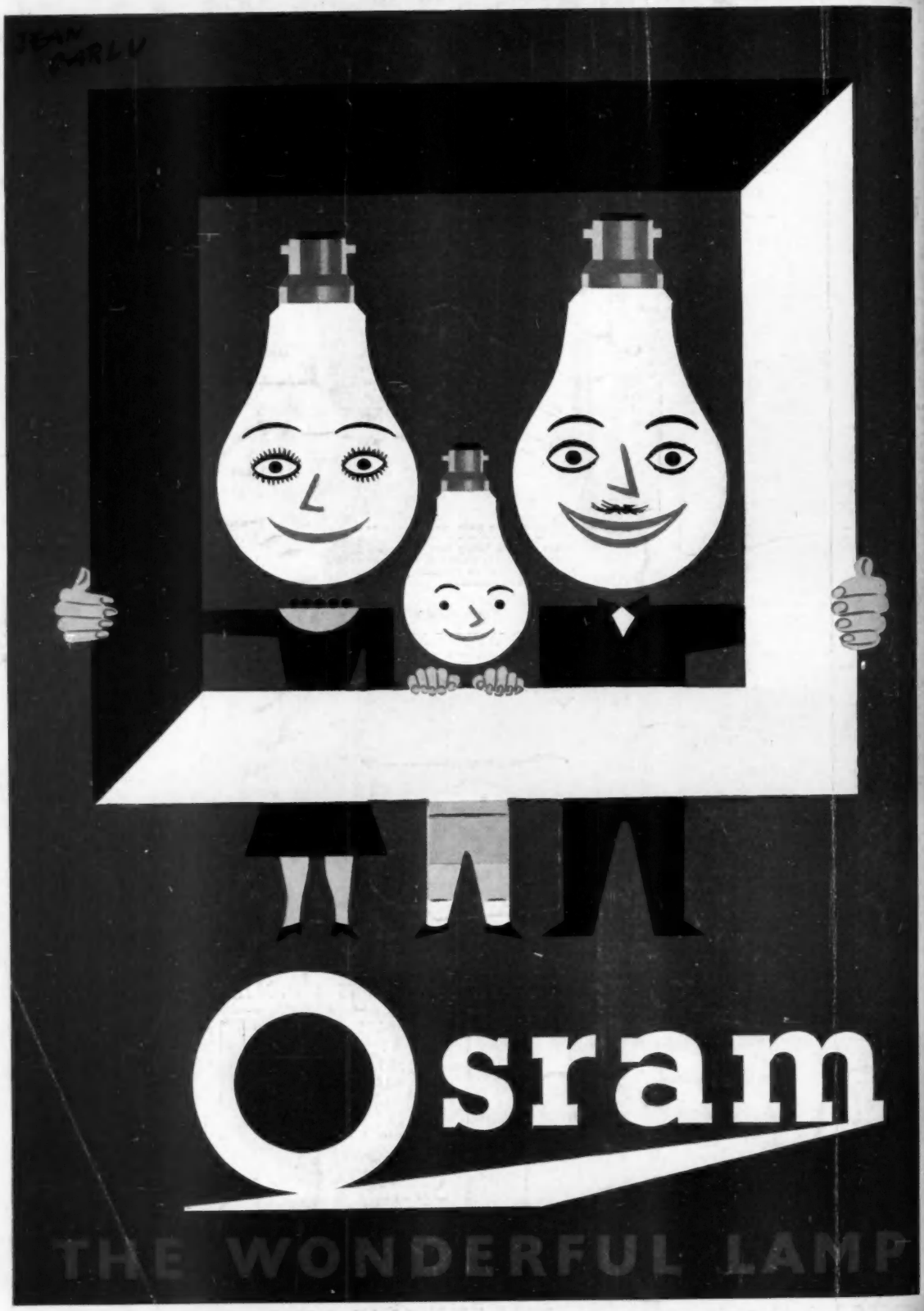
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